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THE RIVERS OF NORTHERN NEW JERSEY, WITH
NOTES ON THE CLASSIFICATION OF RIVERS IN
GENERAL.

By WILLIAM MORRIS DAVIS.

OUTLINE.—Rivers of different kinds: consequent, antecedent, superimposed, subsequent, adjusted.—Topography of Northern New Jersey.—Revised and superimposed rivers in New Jersey.—Drainage of the Watchung crescent.—Re-arrangement of superimposed rivers by the growth of subsequent streams.—Application of this principle to the Green river in the Catskill mountains: Powell's and Ramsden's theories.—The Green river probably superimposed and its branches re-arranged by the growth of subsequent streams.—Anaclical and reversed rivers in New Jersey.

NORTHERN New Jersey is drained by several streams which rise in the Archæan Highlands, flow southeastward across the central Triassic plain and reach the sea near the inland margin of the Cretaceous formation.

What kinds of rivers are these? Such a question can hardly be answered until we have examined rivers in many parts of the world, gaining material for a general history of rivers by induction from as large as possible a variety of examples; and until we have deduced from our generalizations a series of critical features sufficient to serve for the detection of rivers of different kinds wherever found.

The generalizations here referred to may be presented in the form of a classification, following the ideas of Powell, Gilbert, Heim, Löwl and others, as follows :

Consequent rivers.—Those that have in their birth, at the time of their original establishment on the country which they drain, selected courses in accordance with the constructional slopes of the surface ; for example, the Red River of the North and such of its branches as flow on the even surface of the lacustrine plain of Lake Agassiz ; the several streams that drain the broken lava blocks of Southern Oregon ; certain streams and rivers of the Jura that drain the synclinal troughs of these mountains. Consequent streams may be divided into definite and indefinite groups. Definite consequent streams are those that follow well defined constructional channels, such as the axial line of a synclinal trough, or the lowest point of an anticlinal arch between two synclinal basins ; they are defined in location as well as in direction. Indefinite consequent streams are those that flow down constructional slopes, such as the flanks of an anticline, but whose precise location depends on those minor inequalities of surface that we term accidental ; they are defined in direction but not in location ; and they are as a rule branches of definite consequent streams.

Antecedent rivers.—Those that during and for a time after a disturbance of their drainage area maintain the courses that they had taken before the disturbance. In Powell's original definition of this class of rivers, he said that the valleys of the Uinta mountains are occupied by " drainage that was established antecedent to the corrugation or displacement of the beds by faulting or folding."* No limit is set to the amount of corrugation or displacement or to the strength of the faulting or folding. It therefore seems advisable to consider what variations there may be from the strongly marked antecedent type ; one extreme being in those cases where the displacement was a minimum and the perseverance of the streams a maximum, the other where the displacement was a maximum and the successful perseverance of the streams a minimum, or zero. The simplest examples of antecedent rivers are therefore found in regions that have been broadly elevated with the gentlest changes of slope, so as to enter a new cycle of topographic development, all the streams retaining their previous courses, but gaining ability to deepen their former chan-

* Colorado river of the West, 163.

nels down to the new base-level; such streams may be called "revived." Examples of revived streams are very common; nearly all the streams of the Highlands of New Jersey are of this kind; all the streams of central and western Pennsylvania seem to belong in the same class. From these simple and common examples, we shall some day, when our knowledge of rivers is better developed, be able to form a complete series leading to what is generally understood as the typical antecedent river, which has outlived deformation as well as elevation without suffering either deflection or ponding. Large rivers of strong slope, well enclosed in steep-sided valleys, or in other words vigorous adolescent rivers have the best opportunity to persist across a belt of rising or writhing country,* because a great deformation would be required to throw them from their courses. Small streams or large ones of faint slope in an open low country are more easily deflected. From the typical antecedent river, the series may be continued by examples in which even the larger streams are less or more ponded or deflected by the deformation, until at the end of the series there is a complete extinction of the antecedent drainage and the establishment of an entirely original consequent drainage. The perfectly typical antecedent river, in the middle of this series, is certainly of rare occurrence, and is perhaps unknown.

Consequent streams, whose course is taken on a relatively thin, unconformably overlying mass, for a time preserve their initial courses, even though they may be quite out of accord with the underlying structures on which they have descended. Such streams were first recognized by Marvinne, and afterwards named "superimposed," "inherited" or "epigenetic" by various authors. A full collection of examples of this class should begin with streams that depart from true consequent courses only locally, where they have discovered a small portion of the underlying formation, like the Merrimack at Manchester and other water-power towns of New Hampshire, where the stream has sunk upon rocky ledges beneath the surface drift and sands; or like the Mississippi and other rivers in Minnesota which have in places cut through the drift sheet to the underlying crystallines. The series would conclude with streams that have stripped off the cover on which they were consequent, and have thus become superimposed on the underlying formation in their whole length.

* Star's expression "*Gebirgshub oder Gebirgsschub*" suggested to me the terms here employed.

There is a curious intermediate type of drainage lately recognized by McGee in the southern states, a superimposed drainage that is not inconsequent upon the buried surface beneath the unconformably overlying surface layer. It occurs in regions where a well-marked drainage had been established; a brief submergence then allowed the deposition of a relatively thin mask of sediments; an elevation brought the masked surface up again, and as it rose, the streams took possession of lines essentially identical with the courses of their ancestors, because the mask of newer deposits had not extinguished the antecedent topography. McGee proposes to call such streams "resurrected."

Rivers of all classes as a rule develop during their adolescence and more mature growth certain "subsequent" branches that were not in any way represented in the early youth of the system. Thus the indefinite members of the consequent drainage of the Jura mountains have developed subsequent streams on soft beds of monoclinal and anticlinal structures, where there could not possibly have been any consequent drainage lines at the birth of this system, unless we admit the supposed fracturing of the anticlinal crests, which seems unnecessary to say the least. Even in the simplest style of drainage, growing on a level surface, many of the branches must be "subsequent," or as McGee has called them in such cases, "antogenetic."

Rivers of all classes are subject to spontaneous re-arrangement or adjustment of their courses to a greater or less extent, in accordance with the weaker structural lines. This results from the migration of divides and the consequent abstraction or capture of one stream by another. The capture is generally made by the headward development of some subsequent branch. But after this kind of change has advanced to a certain extent, the divides become stable, and further change ceases. The rivers may then be said to be maturely adjusted. Under certain conditions, chiefly great initial altitude of surface, and great diversity of structure, that is, in mountainous regions, the changes arising from adjustments of this spontaneous kind are very great, so that the courses of a river's middle age may have little resemblance to those of its youth, as Löwl has pointed out and as I have tried to show in the case of the Pennsylvanian rivers. It may be difficult to recognize in such cases whether the youthful courses of a river system were consequent, antecedent or superimposed. Adjustments of this kind were not discussed by Powell, although he

makes brief mention of what I have called subsequent streams. The first appreciation that I gained of river adjustments came from the writings of Löw; but I have since found that the general principles governing their opportunity were stated by Gilbert in his monograph on the Henry Mountains of Utah (pp. 141, 146), and by Heim in his *Mechanismus der Gebirgsbildung* (i, 272, etc., ii, 59, 326).

Where do the rivers of northern New Jersey stand in this general scheme of river classification? We must again postpone the answer to the question, while reviewing the history of the general geographical development of the region.*

The topography of northern New Jersey may be briefly described as made up of valleys and lowlands that have been etched in the now elevated surface of what may be called the Schooley peneplain on the Cretaceous baselevel. The topographical atlas of New Jersey should be constantly referred to, in order to follow such a statement as this; but in order that the reader may without undue difficulty apprehend the meaning of my descriptions and recognize the various localities yet to be named without the trouble of searching for them on the maps of the atlas, I have attempted to draw a generalized bird's eye view of northern New Jersey, as it would be seen by an observer about seventy miles vertically above the center of southern New Jersey. The meridians are vertical and east and west lines are horizontal, but oblique azimuths are foreshortened. The result is hardly more than a geographical caricature, and I publish it in part to experiment upon the usefulness of so imperfect an effort. An active imagination may perceive the long even crest line of Kittatinny Mountain on the northwest, rising beyond the rolling floor of the Kittatinny Valley, as the great Alleghany limestone lowland is here called; then come the Highland plateaus, of accordant altitude one with another, but without the mesa-like margin that my pen has not known how to avoid indicating. The Central plain lies in the foreground, diversified by the various trap ridges that rise above its surface; First and Second mountains of the Double Watchung

* The more detailed statement of this history may be found in an essay prepared by the author with the collaboration of Mr. J. W. Wood, Jr., of the class of 1888 in Harvard College, the study being undertaken as a joint thesis by instructor and student in a second course in Physical Geography. The essay is published in the *Proceedings of the Boston Society of Natural History*, 1889.

crescent near the Highlands; Sourland Mountain in the southwest; and Rocky Hill, the southwestern re-appearance of the Palisades intrusive trap sheet, lying a little nearer to us. The Central plain is also diversified by the Fall-line, a slight but rather distinct break in its surface from Trenton (Tr.) on the Delaware to a little below New Brunswick (N. B.) on the Raritan. The important drainage lines are: the Delaware, forming the western boundary of the State, trenching Kittatinny Mountain at the Water Gap, cutting a deep transverse valley through the Highlands where it receives longitudinal branches, and a shallower trench across the Kittatinny lowland and the Central plain; the Raritan, whose north and south branches head in the Highlands, while the Millstone joins it from south of the fall-line, cutting through Rocky Hill near Princeton (Pr) on the way; and the Pequannock-Passaic, rising in the Highlands, gathering tributaries in the low basin behind the Watchung ridges, and escaping to the front country as a single stream, the Passaic, through deep gorges at Patterson. The terminal moraine, marking the furthest advance of the second glacial invasion of post-tertiary time, is indicated by an irregular dotted band crossing the State, from the Narrows of New York Bay, which it defines, on the east, passing over Second Mountain by the gap at Summit (S), rising midway in the Highlands over Schooley Mountain, and traversed by the Delaware at Belvidere (B).

The Schooley peneplain is indicated by the crest and summit altitudes of Kittatinny Mountain, the Highland plateaus and the trap ridges. This peneplain once lay low and essentially horizontal, the practically completed work of the processes of denudation acting on a previously high land through a long period of time; it is now lifted and tilted, so that its inland portion rises to the height of the Highlands, which are its remnants, while its seaward portion descends slowly beneath a cover of unconformable Cretaceous beds, southeast of the fall-line, and thus hidden sinks gently beneath the Atlantic shore. The cover of Cretaceous sediments was laid on the southeastern part of the old peneplain during a moderate submergence of its seaward portion, before the elevation and tilting above mentioned (fig. 2, p. 83). Much of the cover has been worn away since the time of elevation (figs. 3-6, p. 85), which gave opportunity for the opening of deep valleys on the soft limestones and slates among the hard crystalline rocks of the Highlands; and for the production of the broad

Kittanning Valley lowland or peneplain on the wide belt of limestones beyond the Highlands; and furthermore for the development of a broad baselevelled plain on the weak Triassic shales and sandstones, where the old peneplain has been almost entirely destroyed. The Cretaceous cover remains only near the coast, where it stood too low to be attacked while the valleys and lowlands just described were carved out. An interesting peculiarity in the relation between the newer baselevel plain on the Triassic area and the old Cretaceous peneplain is that their surfaces mutually intersect at a small angle along the line which now marks the visible contact between the Triassic and Cretaceous formations: the newer plain standing beneath the eroded portion of the older one northwest of this line, while it rises above the buried part of the older one and obliquely truncates its Cretaceous cover to the southeast of the line. Finally, the land as a whole has been raised a little since the making of the newer plain, and shallow valleys interrupt its broad surface. It is no longer a true plain; it has become a pastplain. A few words may be allowed me concerning these terms, peneplain and pastplain. Given sufficient time for the action of denuding forces on a mass of land standing fixed with reference to a constant base-level, and it must be worn down so low and so smooth, that it would fully deserve the name of plain. But it is very unusual for a mass of land to maintain a fixed position as long as is here assumed. Many instances might be quoted of regions which have stood still so long that their surface is almost reduced to its ultimate form; but the truly ultimate stage is seldom reached. We can select regions in which the valley lowlands have become broad and flat, the intermediate "doubt" hills have wasted away lower and lower until they are reduced to forms of insignificant relief; and yet the surface still does not deserve the name of plain as unqualifiedly as do these young lands newly born from seas or lakes in which their geometrically level surfaces were formed. I have therefore elsewhere suggested* that an old region, nearly baselevelled, should be called an almost-plain; that is, a peneplain.

On the other hand, an old baselevelled region, either a peneplain or a truly ultimate plain, will, when thrown by elevation into a new cycle of development, depart by greater and greater degrees from its simple featureless form, as young narrow valleys

* *Amer. Jour. Sci.*, xxxvii, 1889, 439.

are sunk beneath its surface by its revived streams.

It is no longer truly covered the name that was properly applied to its former elevation. It may not again be called a peneplain, for it is now not approaching to a most interesting a smooth surface, but is becoming rougher and rougher. It has passed beyond the stage of maximum relief, and this significant fact deserves implication, at least, in a name. I would therefore call such a region a *postplain*. The area of the weak Triassic studies was, at its late elevation, as good an example of an old more developed plain as any that I have found; but now it is a *postplain*, as any one may see while traveling across it on the train: its nooks are broad and continuous, and its valleys are relatively narrow and shallow. The bottoming lowlands are intersected by streams whose valleys sink below its generally even, gently rolling surface, but it was never so smooth as the Triassic plain. It was only a *peneplain*, and it is now a roughened *postplain*. Perhaps the more adventurous and terminology will call it a *post-peneplain*, but I dare not venture quite so far as that. When the Highlands were somewhat, their surface well described the name of *peneplain*; but they were after so long ago into so high a position that they are now cut into a complex series of rugged uplands. They no longer deserve the name of *peneplain*; and if in preceding paragraphs I have referred to them as consisting an old *peneplain*, it is because no satisfactory name has yet been applied to the particular stage of development of plains and plateaus in which they now stand. Having tried in vain to invert a term which which I called the *Highlands*, at my own advertise for one in the pages of our magazine.

Another name applicable to those broken, rugged regions that have been developed by the natural processes of denudation from the once continuous surface of a plain or *peneplain*. The name should be if possible homologous with the words, *plain*, *peneplain* and *postplain*, it should be of simple, convenient and euphonious form, it must be satisfactory to many other persons than its inventor, and its etymological construction should not be embarrassed by the attempt to crowd too much meaning into it. The mere suggestion that it was once a plain and that it is now entirely *Livermore* will suffice.

The topography of northern New Jersey is therefore, like its structure, polygenetic. It exhibits very clearly a series of forms developed under three different geographic cycles, and closer search will doubtless discover forms belonging to yet other cycles,

less compact and of broader curvature than these three. There is the later and less y-crooked peninsula of the Highlands, whose final form may be called the Selkwyk peninsula, from the historical exhibition of it on its summit on Selkwyk's mountain, and was the product of Jurassic and Cretaceous. There is the younger central basins and plains developed during Tertiary time, or creations, on the weaker Triassic and Cretaceous beds, and the associated valleys of the same age that have been sunk into the weakest rocks of the Highlands. There are the sink or valleys in the final plains of the latest post-tertiary cycles, recurring the name of this region to be changed from plain, as it was at first, to postplain, as it is now. The first cycle, in which the Selkwyk peninsula was produced, witnessed the development of a great work; it included in its later part, besides various other great things, the an-cyclo when the seaward extension of the part of Japan was gently so changed and formed a new length under former inequalities. The second cycle was shorter, being a time sufficient to displace the softer beds, but not sufficiently to consume the harder parts of the pre-existing surface. We are still in the third cycle, of which but a small part has elapsed. The question with which this essay opened may now be taken up.

The streams and rivers of northern New Jersey may be examined, with the intention of classifying them according to their conditions of origin, to their degree of compactness as indicated by the number of geographic cycles through which they have lived, and to the advance made toward their future adjustment.

The Musconetcong may be taken as the type of the Highland streams. It flows southward along a narrow mountain valley between crystalline plateaus of other beds, entering the Delaware a little below Forton, Pa. (Pl. fig. 1). It drains a country that has been enormously denuded, and during the Jurassic period there must have been a great effort to become thoroughly adjusted to the structure of the region; it must be chiefly for this reason that it flows so closely along the weak hamstone bed, and has its divides mostly on the adjoining harder crystallines, (Pl. fig. 2). Whatever its origin, it has lost every natural feature that was discordant with the deep structure that it discovered beneath the initial surface, it is a streamy and, tied to its environment, it goes on

to much of age during the base-leveling of the bedrock peneplain, and is now a "revived" stream, in at least its second cycle of work. Most of the other streams of the High Plains and the country farther inland are also of this well-adjusted, revived kind. The streams of the Kittatinny valley lowland show not only the first revival of the kind just described, but also a second revival, in consequence of the recent uplift that has involved the third cycle of development, this not being so clearly manifested in the Highlands, where the rocks are older, and the valleys of the second cycle are narrower.

Look now at the drainage of the crescentic Watchung mountains, the curved edges of two great warped lava flows of the Triassic belt. The noteworthy feature of this district is that the small streams in the southern part of the crescent rise on the back slope of the inner mountain and cut gape in both mountains in order to reach the outer part of the Central Plain. If these streams were descended directly or by revival from sources antecedent to or consequent upon the normal tilting of the Triassic formation, they could not possibly, in the long time and warped condition that the region has now reached, have down to the present time maintained courses so well adjusted to the structure of their basins. In so long a time as has elapsed since the tilting of the Triassic formation, the divides would have taken their places on the crest of the trap ridges and not behind the crest on the back slope. They cannot be subsequent streams, for such would not have pushed their sources headwards through a hard trap ridge. Subsequent streams are developed in accordance with structural details, not a variation of them. Their courses must have been taken *not long ago*, else they must surely have lost their head-stocks of the second mountain, or the potential subsequent branch of a larger transverse stream, like the Passaic, would have been established.

The only method now known by which these several nearly transverse streams could have been established in the not too distant past, is by superimposition from the Catawba cover that was laid upon the old Seaboard peneplain. It has already been stated that when the Highlands and this region together had been nearly base-levelled the coastal portion of the resulting peneplain was so merged and buried by an enormous cover of waste derived from the submerged portions hence when the whole area was lifted to something like its present height, a

new system of consequent streams was laid on the reversed section. Since then, time enough may have passed to allow the streams to sink their channels through the unconformable cover and strip it off, and to transport some of the debris on the Triassic rocks below; we should therefore find them, in so far as they have not yet been readjusted following incision, on the discordant surface on the under formation. The existing overlap of the Cretaceous beds on the still buried Triassic portion of the outcropping peneplain makes it evident that such an origin for the Watchung streams is possible, but it has not yet been adequately proved that the Cretaceous cover ever reached so far north as to cross the Watchung.

Want of other explanation for the Watchung streams is not satisfactory evidence in favor of the explanation here suggested. There abounds the external evidence that the Triassic area was actually buried, submerged and buried after it was baselevelled to the Schooley peneplain and before it was uplifted to its present position. Other streams as well as the ones here far investigated show a bearing of superimposition, and if adjustment of the superimposed courses has begun, it should be systematically carried furthest near the largest streams. I shall not here state more than in brief form, the sufficient evidence that can be quoted in favor of the first and second requisites. Suffice it to say that the overlap of the Cretaceous beds (which contain practically no Triassic fragments) on the buried Triassic strata at Ambury and elsewhere indicates submergence after baseleveling; and that the pebbles, sands and marks of the Cretaceous series point clearly to the Highlands as their source. The submergence must therefore have reached far across the Triassic formation at least to the margin of the crystalline rocks. Some shoreward cutting must have been done at the margin of the Highlands during Cretaceous time, but the generally southern surface of the outcropping peneplain leads me to ascribe its origin chiefly to a general warping. Moreover, the North Branch of the Raritan, between Mondamin and Peapack (* Fig. 1) and the Lockatong Co., a small branch of the Delaware on the West Hunterdon granite plateau, give striking indications of superimposition on the discordance of their courses with the weaker structural lines of the Laramie, so unlike the thoroughly adjusted course of the Musconetcong and its fellows, the Pohatcong, the Lepautecong, and others.

The third requisite of the proof of the canal extension of the Crataegus, and the resulting superimposed origin of the Watchung streams may be stated in detail, as being more in the line of this essay: has the adjustment that accompanies superimposition systematically advanced farther up the large streams than near the mouth ones? The character of this adjustment should be first examined deductively. Given a series of streams of different volumes, flowing westwardward, in the direction of the present dip of the remnant of the Crataegous cover, over the Eimer island extension of the superposed formation, how will these streams react on one another when they sink their channels into the underlying Triassic formation?

The reactions during the formation of the cover of Crataegous rocks are illustrated in fig. 2, where the Triassic portion of the



peniculus is submerged, and the shore-line of the transgressing ocean has reached the margin of the crystalline rocks. The waste from the crystalline rocks is spread out as a series of flutes, and is marked on the base level of Triassic rocks.

Then follows the elevation and tilting of the peniculus with the cover on its back, and with this regression of the sea, there is an equivalent gain of new land, a smooth, gently sloping plain is revealed as the shore line retreats, streams run out across it from the crystalline rocks, or begin on its open surface growing in width and as the land rises. Three such streams, A, B, C, shown in fig. 3; their comparative deep valley-cutting is indicated by the depth of the new basins, BL, below the general

surface of the country. While these streams are deepening their channels in the Cretaceous cover, which is crossed with marginal contour lines in the figures, their subsequent, autogenetic branches are irregularly disposed, because there is no lateral variation of structure to guide them, but after a time, the base levelled surface of the buried Tertiary beds is reached, as is shown by linear marking in the valley bottoms of figs. 4, 5, 6, 7. The growth of the subsequent branches then developed, will be along the strike of the Tertiary softer beds, that is, about equal



and transverse streams, but the location of most rapid growth will be found on the branches of the largest stream, A, because it will most quickly cut down channels on the base level of the land and thus provide steep, sloping valleys, from which the subsequent branches will headwards most energetically. In the time the main streams discover the particularly resistant transverse lava sheets in the underlying formation; and then the subsequent branches of the largest transverse stream on the up-stream side of the obstructions, for example, B and C, fig. 4, will have a great advantage over those of the smaller streams. The most rapidly growing subsequent branch, G, fig. 5, of the largest transverse master stream, A, may grow headwards so fast as to push away the divide, X, which separates it from the head of the opposing subsequent branch, J, of the next adjacent smaller transverse stream, C, and thus finally to capture and divert the headwaters, I, of the smaller transverse stream to the larger one, as in fig. 6.

The double creeps while the two opposing subsequent channels are in contact; it captures and the successive is acquired from a reaches (and shape) of the captured stream. The first stream captured in this way must necessarily be the nearest to the larger stream. The diversion of the subsequently acquired headwaters, of, to the channel of the small subsequent branch, C, causes it to



deepen its channel rapidly; the same effect is perceptible in II for a distance above its point of capture and diversion - the increased load of sediment thus given to it will be in great part dropped in a fan-like where it enters the flat valley of the master stream, A, (fig. 6)

Gaining strength by conquest, other captures are made, faster for a time, but with decreasing slowness as the head of the divert-

ing subsequent branch recedes from the original master A, C , at last, equilibrium may be gained with the low water slope of the inverted branch X, Y greater than that of the opposing subsequent branch of the next uncaptured transverse stream. After the capture of a transverse stream has been effected in this way, the divide, Y , between its diverted upper portions, H, I, G, O , and



FIG. 6

is headed over portion, L , will be pushed over stream by the growth of an inverted stream, V . It goes on until equilibrium is attained and further shifting is prevented on reaching the hard transverse lava sheet, Z , fig. 7; here the divide is not only



FIG. 7

not a sheet. In the case of a system of transverse streams, C', D , etc., fig. 7, successively captured by the subsequent branch of a single master, the divides (Z, Y), between the inverted (V, V)

and beheaded (C , D) portions of the captured streams α , β for a present a different stages of approach to establishment. It is also on the line of that one of the original streams, C , that the nearest fact is master stream, A , may reach a final stable position, A_2 ; while on the next stream farther away from the master, the beheaded portion, D , may still retain a short piece above the gap in the upper lava sheet, not yet secured by the inverted stream, A_2 ; and a third stream, farther away still from the master (not shown in figure 7) might remain uncaptured and independent.

It is by such tests as these that we may hope to recognize the occurrence of partial adjustment in the streams of the Watchung region as a result of their superimposition on the Triassic formation in its former & retrograde course. The greater the degree of complexity in the tests proposed, the more confidence we shall have in the theory when the tests successfully meet the facts. Hence the reason for steadily carrying out the theoretical conclusions to their extreme consequences in order to increase the complexity of the tests that are to be confronted with the facts. This, as a matter of method, seems to me of great practical importance in any attempt to deal with the past progress of geographical development.

The admirable contour and topographic maps of New Jersey, issued by the Geological Survey of that state under the direction of the late Professor George H. Cook, all taken from the original topographic sheets, are of great value in the study of the drainage of the state. The derivative tests above outlined without the necessity of drawing over a plan of the country concerned; but however good the maps are, it is hardly necessary to say that they can be no substitute for a better appreciation of the facts that they represent after an examination of the original maps. The student would do well to acquaint himself with the original maps. I have tried to make out various drainage systems, and to find out the facts that they represent.

Atlas sheet 5, under 50, including the Central red sandstone, and the five million scale good road map of the state present in the clearest manner the facts of form and structure involved in our problem, and to say more, the correspondence between theory and fact is very striking. The Pequannock Passaic is the master transverse stream of the region; its predominance was probably due to the region being the gateway from the mountainous Highlands, a greater amount of drainage than being dumped to any other stream that ran southwards down the gen-

an slope of the newly revealed Cretaceous cover. It was at that time a non-polluted, gentle river,* composed because it drained areas of different ages, some older, because these areas were of a different structure. Following examples of compound, composite rivers are seen in the Connecticut, the Yaquina River, the Cape Fear and the Neuse rivers of North Carolina, which rise on the plain crystalline area, and traverse the coastal quaternary plain before reaching the sea. But not so these, there must have been when the soil subsided and a new water the Cretaceous cover on its back, numerous small streams whose drainage area lay within the Cretaceous plain. These were simple streams, it was never a structure of one kind and one age. Their modern homologues are seen in the Hudson, the Great and Little Egg Harbor and the Wandeg rivers of southern New Jersey, and I suppose also in various relatively plain streams of North Carolina, such as the Lenoir, Great Coho and the Albemarle.

It cannot be questioned that the original Pequanumock Passaic possessed the large southern branch, which I must call the upper Passaic, by which a Great Swamp is now drained, if far had this been the case, the divides between the branches of the upper Passaic and the heads of the small streams that now all cross both of the trap ridges, must have long ago been driven to a stable position on the crest line of the inner ridge. The upper Passaic member of the Pequanumock-Passaic system must be regarded as a branch of subsequent development, evolved by some of the softer Triassic rocks when they were reached upon the Cretaceous cover, and very successful in capturing and diverting other transverse streams that were older than its master. For some distance on either side from the Pequanumock-Passaic gap in the trap ridges at Patterson, the existing streams are perfectly adjusted to the Triassic structure; that is, the ridges are permanent divides, and the lateral subsequent branches of the master flow along the strike of the softer shales and sandstones, except where interrupted off their course by general drift barriers. This fact itself is bearing witness that the Pequanumock-Passaic master

*See terminology suggested by the author. *N. Amer. Mag.*, 1, 1880, 217.

† It should be recognized that the present rounded surface drainage of the Great Swamp is a post-pluvial feature, determined by the formation of a barrier that crosses the basin from Summit 18 to Morristown. At the present stage of the southern part of the inner crescent was undoubtedly of a simpler and more direct pattern.

stream headwaters arose so early and late at a point of superimposed streams that all traces of their initial discordant courses are now obliterated by the development of structurally discordant subsequent streams.

The Watchung ridge extends only about eight miles northward of the Paterson gap, but reaches thirty miles southwestward. It is therefore chiefly in the latter direction that we may expect to find examples of linear paleo-pluvial flow along a prominent mountain capture. At Midburn, there is a deep gap in the mountain, and opposite this at Summit (S, fig. 1) a partly eroded gap in Second mountain, this I am disposed to regard as the former outlet of the Hackaway-Hackaway river, which is abundant.

Its considerable size was not captured by the Passaic until it cut its passage across the trap sheets almost to a safe depth. The overland upper section of the Hackaway—now joins the Passaic—its tracked course from the highland via Midburn (fig. 1) being a post-glacial irregularity, the subsequent lower portion of the Hackaway—beams on the ridge of Second mountain, returns the water of numerous streams between the two ridges, and flows in an unimpeded way to the sea. The divide between the two portions being of a structure still prominent on Second mountain.

South of the Midburn gap, there are three streams that maintain water courses in First mountain, and five headwaters of these three streams may be seen the crest of Second mountain. These must be interpreted as remnants of stream as that once rose from a highland, now whose water courses have been captured by the water mark upper Passaic. It is noteworthy that here, at the greatest distance from the gap of the master stream, at Paterson the divide between the discordant mountain low portions of these mountain streams seems to be a gradual position, such as the crest line of Second mountain. This is exactly what the type

a superior master stream of these streams would require, and of the complexity of discordance between the water mark and the present water mark. I believe we could not say in general that the type of superior master stream could not be traced from the evidence.

The remaining courses of the streams that flow from the highland are now lowest of the mountain, and are not against their initial high quality superimposed courses, for as to their final flow, the upper courses across the highland are only high, and not, and gradually sink and follow the low-lying courses.

along the strike of the soft beds and square across the strike of the hard beds. Middle peak of the southern head of Fraser mountain near Round Brook (B. B.), presents the peculiarity of bearing high east and west wings on the trap sheet of the mountain. This may be due to a refolding here, where the dip is moderate, of an already superimposed deformation; or to guidance by fractures at this point where the course of the mountain changes rather abruptly; the facts at hand do not serve to name either outcome, these a feature.

The lesson of greatest importance in this study lies, to my mind, in the gradual development of an ancient subsequent stream in a region where the unchanged or semipreserved drainage would seem to be the more chance. Similar adjustment of subsequent stream to structural features may characterize drainage systems that were originally antecedent, and with this principle in mind, I have recently read over with renewed interest Powell's description of the Green river where it crosses the Uinta mountains. The Green river and its smaller stream, in all its lateral canyons and valleys are all regarded as antecedent. Let us examine the argument on which this conclusion rests.

The Green river itself rises many miles north of the Uinta range, traverses a relatively low basin before reaching the flank of the mountains, and then instead of turning away, it boldly enters the great uplift and traverses it from side to side in a zig-zag and circuitous way, to the south-west in its way to the mouth. There is relatively low ground at the eastern end of the range, several thousand feet lower than the summits of the range on either side of the Green river cañon, and many thousand feet lower than the restored crest of the great uplift; but the river does not follow this open road, as one might expect. Powell says that the river cut through a system of rolling upland, the great obstruction, because it "had the right of way; i. e., it was running in the main channels were formed." Had the mountains been formed before the Green river, says Powell, it would have followed the open road.

"The evidence of the fact above the general surface of the country was not so fast as the progress of the construction of the channel," says Powell. "The river preserved its way to the mountains were formed. The river was the way."

* Examination of the Colorado river of the west, Washington, 1874, 132-104. See also the geological map in the Geology of the United States, 1874.

which cut the mountains in two" (ibid, 154). If this interpretation is correct, the Green river would be the type of a perfect antecedent stream. But it occurs to me that the case is probably over-stated in that respect. Perhaps it would have been more definitely stated in a later volume if Powell's attention of recognizing it fully for three eons and as one of the age of the region had been carried out*. Not having seen the region, a writer may have been wrong; but the context of Powell's report, the description of the immense series of lacustrine beds, over a mile thick, north of the mountain, and the marked deflection of the river which traverses the mountains southward, and the fact that the Green was by no means continuously succeeded in its original antecedent course across the uplift. It is by

the great series of lacustrine beds from the canyon, to a range of tables where they cross the eastern flank of the mountains, are fully recognized in the report, and must mean that the upper portion of the river was for a time shut back, or perched. During part of this time there may have been an overflow across the growing mountains, for the lower lacustrine beds contain fossils indicative of creekish water†. The intermittent growth of the mountains and the repeated return of lacustrine conditions, with gradually freshening waters, as indicated by the strong zonation of the beds, and by the change in the Green fauna. It must be concluded from this that the upper portion of Green river was repeatedly perched back by mountain growth across its middle course; we therefore have not now any clear indication of its pre-lacustrine course above the mountains; the present, or pre-lacustrine, upper portion of the river was extinguished by the lacustrine deposits, and to this extent the Green river is parts from the perfect antecedent type.

In the second place, if the original Green river existed upon the upper surface of the beds that were at a subsequent date raised to form the Tinto uplift it does not appear to be proved that its course at that early time was closely identical with its present course in the Tinto mountains area. The first deformation of the mountain growth may have temporarily interrupted its flow, as is done likely by the lacustrine deposits

* Green Tinto mountains, page 4

† Geology of the Tinto mountains, 1876, 84; Chapter III, by C. A. White.

but flow northward from the Alps, and transect directly a large portion of the captured drainage basins, conglomerates and sandstones, which he regards as the debris formed by the same rivers at an earlier time, when the mountain building had not extended outward as far as it does now from the axis of the Alps. I have suspected that the same kind of evidence might be used to indicate that the Hea were above Tropic, between Jersey and New Jersey, as a part of even pre-Triassic or even older, where it now enters the Triassic belt, there is a particularly heavy and coarse sandstone, sometimes conglomeratic. Being a large stream, it might persist in an anomalous course through the northern part of the formation formed by the Triassic up to the Triassic belt, although the smaller streams of the region were then probably extinguished, to be replaced by a new system consequent upon the new order of things.

Large rivers, more or less persistent in the face of opposing disturbances, should be expected to be generally recognized, but it is

possible that those derived from the Himalaya and the Alps pre-existed, and, at the time of elevation, with one exception, from which it would have been a threat for them to escape backwards or laterally, and that even if successful in the end, they for a time suffered defeat or ponding of greater or less extent and duration. There is no evidence that the Green river was yet enclosed immediately north of the Laramie mountains at the time of their first elevation, hence we had doubt as to a primary ponding or encasement is increased.

It is stated by Peck that not only the Green but even the smaller streams of the Laramie are of origin antecedent to the mountains. He writes "the explanation of the course of the Green river and its tributaries in understanding the origin of the mountain valleys and canyons. The streams were there before the mountains were made—that is, the streams carved out the valleys and left the mountains. The direction of the streams is unquestionable evidence that the elevation of the foot was so slow as not to divert the streams, although the total amount of elevation was many thousands of feet. Had the foot been lifted more rapidly than the principal streams could have cut their canyons, Green river would have been turned about it, and all the smaller streams and waterways would have been obliterated" (Green River, 103).

This appears to me an improper conclusion, and the evidence of it needs careful attention. It appears that there are several streams which descend from the crest of the mountains towards the flanks, but instead of running the way out to the margins of the foot, they turn along the strike of a monoclimal valley, and to reach the main river by a short cut. Such a stream is an entire cut for a time, then resumed on. It is a reference to them that it is said, "The streams were there before the mountains were made" and again that "the drainage was established a step short of the corrugation or displacement of the surface by faulting and folding" (101). In approaching this case it is

Power says these streams cannot be contemporaneous for "valleys whose present position and corrugation, which was one of the final forms of the origin of the Appalachian, would not have taken the direction observed in this system, they would have been a local, as they ran down from the mountains, and turned into local valleys at the foot, forming a very different system from that which now obtain" (100). Nor can the streams be subsequent, for the "after sedimentary beds, here to the north and south, were found not to have been continuous over the mountain system, but to have been deposited in waters whose shores were limited by the power reaches of the range" (100). Therefore the older but streams must be antecedent.

It appears to me that the possibility of error in the argument of the conclusion of all or some of the map and of needles and the resulting misplacement of stream courses indicates a partial structure—but at the time of the exploration of the Carolina, this important process of the development of rivers was not understood. It now remains a question that the original, consequent, antecedent streams flowing down the slopes of the range from crest to flanks, would have permitted the growing of subsequent non-axial branches on the soft beds last lately discovered, and that the starting of divides in these non-axial valleys, and have led to the capture of several non-axial streams by that particular set of the subsequent branches that grew out from the master stream, the Green river itself. It is the last I apprehend that the streams "which descend at the summit of the river, and flowing down the flank, turn into the Green river, are, in their upper courses, anticlinal, and when they turn to follow the strike of the rocks and Green river, are in normal" (101)—this being a normal result of river work in cutting through the masses of

rest of rocks of which as hard as iron, were once there. The smaller streams of the Uinta range are there, and certainly not if necessary antecedent to the Uinta uplift—the probability is that they were originally partly consequent, and that at present they have merely adjusted to the structures that they once have crossed.

I have learned so much from the lecture of Lashwelling, as presented in Major Storer's writings, that I should hope to profit by the lesson of the Uinta drainage as well. That is, the probability that an apparently sound conclusion may be overturned when new processes that bear upon it are discovered. It is here and there the drainage of the Watchung country in New Jersey is an example of partial adjustment following a supposed original action the necessity of which is only for the discovery of new principles in the history of river work that is given for a review of this conclusion.

There are two other examples of particular interest in the history of rivers. New answer to which I wish to call attention both of them in the west side of the development of the States, that is, in the north-west side of the continent, from the

prehistoric low at a source, to the high mountain as we now see it. Take the upland of the Schuylkill (Illinois) country, the upland of the Central plain, in case of the lower

ly, he was not uniform throughout, but was greater in one place than in another. In the lower part of the lower Raritan river, a distinct though gentle slope to the northwest is apparent

of the upland. The river is a stream of the upland, and is a stream of the upland. The river is a stream of the upland, and is a stream of the upland.

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hard trap ridge of Rocky Hill, where a stable divide would have been formed; nor can the Malstone be regarded as an original stream, first developed and consequent upon the deformation of the Central plain, for in that case, it should consist of two separate parts; one part running from the actual head of the river to the fall line, where it would turn so that it now crosses the fault that divide that separates it from the Delaware; the other part beginning by Princeton north of the fall-line, and running thence north to the Barren. The continuity of these two parts in the actual Malstone seems to be explicable only by regarding the river as the upper portion of a single larger river that had reached an old age in the previous cycle. It was then broken in two at the head of the present river where the greatest amount of

The Central plain occurred, and thus had its former head waters reversed from a south east to a north west direction of flow across and against the fall line break by the tilting of the plain. Only in this way can the deep gap in Rocky Mt. be explained. The river is thus consequent on the tilting of the plain, and yet a antecedent to the accompanying faulting. It cannot be called an original stream, for it had an antecedent in its very channel. It is not a purely consequent stream, for it runs against the heaved side of a fault. It is not a strictly antecedent stream, for it flows in a direction determined by a disturbance that occurred late in its life. It is too exceptional a stream to have a generic name. We cannot expect to find many others like it.

The result has been of the greatest interest to me. These studies is the discovery of well recorded and peculiar histories in the commonplace sun-dried rivers of our Atlantic slope. We have looked for some years to the west as the region where river history could be illustrated, because it was there that the in this branch of study taught us the lesson on which work must depend. But to me study as well as distant rewards, and with the progress of good topographic work on the east of the country we are really aware much instruction from a close acquaintance with the histories of many of our rivers which we know now only by name.

*Largest of all software, 1974

Supplementary Note. Professor Albert Peter of Vienna has published a valuable essay on "Die Bildung der Doppelhaare" (*Verein zur Verbreitung naturwissenschaftlicher Kenntnisse*).

case in Wau, 1885) from which the following historical notes are taken to illustrate the gradual overthrow of the fracture theory of cross valleys by the introduction of the idea that rivers can withstand cut down their beds as fast as the land is uplifted beneath them.

Prof. Hümer, *Die Jura von Weserkette Zett. d. deutschen geol. Gesellsch.*, ix, 1857, 541. The deepening of valleys by rivers and streams does not keep pace with the gradual elevation of continental masses. The Elbe in Westphalia has thus been cut by the West in the Wied or Wester range, in the north-eastern part of Westphalia.

A similar suggestion was briefly made a little later by Beekoff, to explain the gorge of the Rhine below Bingen. *Lehrb. d. Geogr. u. phys. Geogr.*, 2 Aufl., i, 1874, 382; and again in expanded form for the same river by Dicker. *Zeitschr. d. deutsch. f. Naturh.*, Berlin, v, 1876, 181.

Humboldt explained the course of the Ahr as a branch of the Danube which crosses the Frankish Jura in north-western Bavaria, supposing its course was defined before and maintained during the formation of the range. *Bavaria's Jura*, in *Verh. k. k. Geol. u. k. k. Bergbau-Minist.*, 1866, iii, 756.

Mitchell recognized as many streams flowing from the outer Himalaya are older than the outer ranges, and is a good reason for believing that they hold their places while the outer ranges were being lifted up. *Mem. Geol. Survey India*, vi, 1866, p. 122, 127, 137, 141. At the same time he applied the same explanation to some Asian rivers. The Alps and the Himalayas, a good reason for comparison. *Q. J. Geol. Soc.*, London, xix, 1868, 47, 5.

Wyllie explains the existence of rivers of greater age than the elevation of the Sant Range in north-western India. *Mem. Geol. Survey India*, x, 1875; xv, 14, 8.

Ratzenberger recognized the possibility of uprisings being cut down by transverse rivers, but regarded the occurrence as a rare one, thinking that lakes would generally appear behind such a growing barrier. He emphasized the fact that erosion works upstream, which Lord has since developed farther. *Lehrb. d. allg. u. bes. Geogr.*, Basel, 1890, 3 Aufl., 1674.

Thietze negated the persistence of rivers across growing ranges as the rule rather than the exception. *Die Bildung von Gebirgsbächen*. *Jahrb. d. k. k. Geol. Reichsanst.*, viii, 58.

Hayden was perhaps the first to point out in this country the antecedent origin of certain headwaters of the Missouri in Montana, where the mountain ranges are frequently cut across by deep canyons. *Amer. Journ. Science*, xxxiii, 1887, 300. Hayden's Sixth Report, 1872 (1873), 85.

Reference may be made also to White, Hayden's Tenth Report, 1876 (1879), 52; Peale, *id.*, 167; Hayden, *id.*, 212. Canons, discussion of valley making is given by Girard, *Geography for students and general readers*, London, 1870; Hartung, *Lehrbuch der Geographie*, Braunschweig, Berlin, 1878, 208.

In spite of the early date of some of these essays, the idea of the antecedent origin of rivers did not gain general recognition and acceptance till it was strongly stated by Powell.

BERINGS CHART

FIRST VOYAGE

FROM D'ANVILLE'S ATLAS

1737

The first published map of the
Exploration

First voyage of the

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A CRITICAL REVIEW OF BERING'S FIRST EXPEDITION, 1725-30, TOGETHER WITH A TRANSLATION OF HIS ORIGINAL REPORT UPON IT. WITH A MAP

By Wm. H. Dall.

CONTENTS.—Introductory remarks. Instruments and Method of securing information.—Translation of Bering's Report. Bering's Itinerary and Positions. An Itinerary of the Expedition. Index. Synopsis of the Voyage compiled from all sources of knowledge. Comparative Table of Geographical Positions.—Knowledge of the results of the Expedition.

In 1848 the tide of exploration and adventure setting eastward across the Siberian empire, and the fitting out of seven small iron boats on the Kolyma river. Three of these, in charge of Samuil Dashneff, Gerasim Alexandroff and Piotr Alexeeff, respectively, crossed Bering Strait.

Alexandroff's boat was wrecked on Kaget Island, but the party was accommodated on the others. Three weeks later when the link in the two boats was separated, Dashneff's crew finally reached Kamtschatka.

Next year he constructed the trading post on the Anadyr river subsequently known as Anadyra.

Three years later, in 1851, a party of four, under Sergiy Fedotkin and Alexeeff's son, made a portage across the neck of land between the Kamtschatka Bay and the Koryn Bay, and reached the Gulf of Pelly in safety.

A messenger named Piotr Ivanovitch Popoff was sent to the natives to induce the Chukchi to pay tribute. In this he failed, but he brought back a number of articles he found and captured a number of natives by the Gulf of Laptev.

Although some stationers were established on the coast previous to this, and some were regarded as the representatives of the last century as being ignorant of the progress of knowledge, they set the seal upon the entire coast. Pelly's report and show that a journey was really made.

The publication of reports which proved that Western life was about this period, prevented any attention from being directed to the reports of these explorations which were preserved in the archives at Yakutsk. Somewhat after the attention of geographers was attracted to the subject.

raphers was directed toward this unknown corner of the world.

The subject was brought to the notice of Peter the Great. He took great interest in it, gave up instructions for an expedition with his own hand and directed him to Count Apraksin with orders to see them executed. A few days later, in January, 1733, he died, but the Empress, desiring to carry out all the plans of her deceased husband as closely as possible, ordered their execution. Fleet Captain Vit's Irmov, a Hering was nominated to the command of the expedition and his officers were Martin Spangberg* and Alexei Chirkoff to be his assistants.

The expedition forms the subject of this paper. I have been told of by various geographers and historians, but so far the only report of it has been printed in 1837 in the Russian language, has never been correctly translated into any other language, and our map has never in its entirety been published, although Redford's chart derived from the results of more or less correct and partly incorrect versions of the report have appeared in our maps of voyages, and even those two latest publications the history of the expedition have been in great part based.

Knowing that the original report was a document of sufficient value and geographic interest to be made accessible to the world, and that the errors of existing works were considerable, and of the subject desirable, I have translated the account, and quoted the principal facts, a general review of the present state of our knowledge in regard to the expedition.

The original report was written in Russian, now in the Imperial Museum, and is a single sheet of parchment and of a literary character, but the handwriting is somewhat illegible, in some places which I have had to correct.

Museum scholar Mr. J. Curtin. I am indebted to the Reverend Father Michael, president of Georgetown University, and Father Mass of Woodstock College, Md., for valuable information.

In regard to the various fossils and shells, whose names were utilized in the nomenclature of Hering's new discoveries. To Mr. Martin Baker, Messrs. Van Fleet and Woodward and Mr. C. C. Darnall of the Geological Survey. Dr. S. Hertzberg.

The Zoological Museum of the Academy of Sciences, St. Petersburg; Baron N. S. Sars of Stockholm; and Baron Robert von Kofstrom; Dr. Hohn and Staeger of the U. S. National Museum, and Prof. J. A. C. Smith of Madison, Wisconsin, I am

* Now settled in Hering himself.

indebted for numerous favors and courteous assistance, and to all of them again I desire to express my thanks.

In conclusion I desire to state that I am well aware this paper cannot be regarded as a theory, but as a contribution to the geographical history of North America it will not be without its value, while the fact that I have myself spent parts of three summers in scientific exploration of the coast visited by Hering and first charted by him, has greatly aided me in my discussion of minor details of his work.

INSTRUMENTS AND METHODS

In considering the work done by the expedition it is necessary to bear in mind the character of the astronomical outfit if any, which they might have possessed, and the state of the science of navigation at the time.

Walter Hering and his two cartographers left St. Petersburg in February, 1725, the astronomical instrument in use by navigators was the Davis quadrant or "barkstaff," in which the solar altitude was measured by sighting without a telescope or tube on the shadow cast by the staff from one project.ion of the instrument. In measuring, the observer's back of course, being turned to the locality. The only alternative to this was the stellar or meridian, with which the observer had to look along the two lines of sight at the same time, and which also depended upon sights or spurs attached to a frame. The reflecting quadrant of Hadley was not invented until 1731 and telescopes were not used on the instruments of navigation until somewhat later. There were no chronometers or reliable watches or clocks for use in dividing intervals of time. Even after the Hadley quadrant came into use, time was noted by a pendulum vibrating seconds, which could not be used on a shipboard.

A futile attempt had been made by means of tables of variation of the compass to determine the longitude by comparison with observed variations in the field. Results by this method depended on the true constancy, if not a larger observance, of the only means of getting an approximate longitude.

Except the oscillations of Jupiter's satellites, both methods being impracticable on board ship, were the instruments then employed.

In 1731 the astronomer Halley proved* that at that date it was still impossible to find the longitude correctly by any method.

* Phil. Trans. 1731, No. 431.

uncertainty being so inaccurate that an error of several hundred miles was quite possible and an accurate determination would depend upon the respective errors of instrument, observation and the lunar tables happening to balance one another. Halley ventured to express the hope that the tables may be so amended that no error may scarce ever exceed three minutes, which would correspond to a degree and a half of longitude, amounting at the equator to a distance of a little less than one hundred miles. Messerschmidt, who preceded Bering as an explorer of Eastern Siberia, was according to Milne-Edwards (*Sib. Reise*, iv, 1, p. 50) thirty-two degrees out in his determination of the longitude, and the eastward extent of Asia in this region was undermined by that amount or thereabouts, on many maps.

One other means of approximating to the meridian is furnished in the observation of eclipses. It is from the comparative rarity of these occurrences in the case of the sun and moon, coupled with the imperfect instruments of those days, that the best solution. Owing to the difficulty of determining the exact time of the first and last contacts the longitudes computed by these observations were but in the quite as great uncertainty as those computed from the more valued still an ordinary observer would stand an observer to time the time within a minute or two and, if he was possessed of the local time, a simple comparison with the observed time of the eclipse in some locality where the longitude was known would give a fairly good determination, considering the instruments and methods of those days. Of the four eclipses of the moon occurring in 1728-29 two might have been observed, with attention by Bering, one would have been invisible to him, as it rose right fairly have been noted, but in all probability was not observed by him. If none of the published reports of the expedition is any mention made by Bering or his officers of the occurrence or observation of an eclipse, which seems very singular if by an accurate observation he was enabled to correct an error of 10° in the longitude of northeastern Siberia. However, Milne-Edwards (*Sib. Reise*, iv, 1, p. 50) states that "Bering and his lieutenant in the years 1728 and 1729 observed in Kamchatka* two eclipses of the moon," by which they corrected the longitude. He gives no authority for this statement.

* It is possible that an eclipse observed at Hunka in Middle Siberia by Chirikoff is thus erroneously referred to.

Euler, who had access to the archives of the Admiralty College, while engaged on a geography of Russia, mentions (Mém. Trav. Acad. Sci. 1744, p. 423) that he was informed that Bering observed an eclipse "at Kamtschatka." This letter of Euler's is copied by Captain Harris' *Voyages* (vol. II, Book III, p. 1024) at the expression "au Kamtschatka" has led to the statement that these observations were made at the fort or village of Lower Kamtschatka. This is a error since Bering gives no length or latitude for the fort in his table of geographical positions. It must be remembered that the name Kamtschatka at that period was applied not merely to the peninsula as it presents, but also to the whole region of northeastern Siberia, the governor of Kamtschatka being located at Okhotsk. So to come within the probable meaning of the phrases used by Maupertuis and Euler it is only necessary to suppose that the observations were made somewhere in that region. ~~Maupertuis~~ (Bouguer relation, note 32, p. 180) refers to a paper of Struve, *Recherches sur la physique du Nord St. Pétersb. I.*, 1742, p. 200) containing a table of geographical positions in Russia, in connection with these alleged observations of Bering. An examination of Struve's paper does not bear out the implication of Latrobe's reference, as Struve not only makes no mention whatever of Bering's observations, but also specifically states that the best observations of positions made in this part of Siberia were those of Krusenstschuk who accompanied Bering's second expedition in 1741. It would seem, extraordinary that a determination so important for geography as that of Bering and his companion should be unknown to so distinguished an astronomer as Struve who must have had access to all the archives of the early explorations by Russia. That it may be perhaps accounted for by the facts that Bering's observations were necessarily of a very rough and primitive character—as it is certain he had no instruments of precision; and that, for that reason, they were not treated with extreme confidence; so that Struve may have considered them as if merely exact to be compared with those of Krusenstschuk and others made with more modern appliances.

From the note in regard to the eclipses which is kindly contributed by Mr. Marcus Baker and from the other circumstances, it is evident that if Bering and his party made the observations alluded to, the eclipses noted were the partial eclipse of Feb. 23 (local midnight), 1728, of which he might have observed the last contact, or the total eclipse of Feb. 24, 1729, of which he might

have observed the first contact and the totality. At the time of the last eclipse he was at Lower Kamschatka post, and as his list of positions headed in with his Report in 1743, no longitude is given. For the locality, it was ascertained that it was as referred to the first of the two mentioned, which occurred when Bering was still at Bosharatka or on his way from that place to Lower Kamschatka, which he reached about a month later. Captain's side of positions is credited by him to the year 1758 but my own position is that it was really derived (with various errors, interpolations, etc., from Bering's table of 1743.

The ordinary method of getting the longitude of a place, and that upon which Bering originally depended, as is a very reliable one, was by a continuous record of the distances and a route of travel, from a point of known longitude. This record would afford the data from which the distance on a mean parallel, by means of a traverse table, could be computed. Laborious, imperfect, and slow as it was, it was the only sure resource of the traveler in those days. Whether Bering observed an eclipse or not, it is certain that his original dependence was upon his own survey, but I suspect it was based upon that and that this part of his work was done as well as the nature of the method would permit. His surprise about the eclipse may be due to the fact that he depended not on astronomical but upon geodetic observations, in which the eclipse may have affected some corrections, at any rate the geodetic determination of the distance between Olenok and Okhotsk or the peninsula of Kamchatka was not to be trusted as infallible.

I find by a rough calculation from Bering's data that the length resulting from his itinerary from Tobolsk to Okhotsk is 1200 miles. The distance by a straight line is about 1000 miles, and by the more accurate method of distances is a little more than 1100 miles. The longitude in Bering's list of 1758

is about 4

longitud. 74 30' E. of Tobolsk, while the most modern observations for Okhotsk put it in 142° 40' E. of Greenwich + 75° 40' E. of Tobolsk. So that Bering's geodetic measurement was nearly 60 miles in excess; his revised table was corrected by the error (see 2) 27 miles in excess; and his map about 90 miles in the opposite direction. These discrepancies show the inexactness of the methods then in vogue and also that the geodetic

school was not very much better than the others in 1870-71. Although there are several typographic or other errors in this copy of a history which render exact comparisons impossible, it may be said that the error of the polar star method of measuring the passage by sea from the north to Kamchatka, averages about two degrees or sixty geographical miles. In the cases of the other and those vessels the error is one of excess, in the case of the escape at the mouth of the Kamchatka river and of the landing point of the expedition within the Bering Strait, the result is two or three degrees short the same.

That has not at all been a revised list of positions since I left the University, quite as when the rest of the cabinet was in what the Institute of Social Work were probably regarded at that day, as being different from that of intentional inoffense.

For merely to see a review of the historical and means and methods then in use, it must be said that the computers in use at that day were extremely poor compared to the modern

The variation was determined in a given attitude by the area 100 of the pedestal of the magnetizing conserves, by means of a scale attached to the top of the conserves, which was a method accurate as far as the general purposes of this

was produced or shaped by the agency
shown herein and perfect in its present form.

It is not possible to predict the exact date of the next election, but it is likely to be held in the next few years. The current government is expected to last until the end of the year, after which a new government will be formed. The election will be held on a date to be determined by the government.

[illegible]

Am free from any of the conditions
 mentioned that bearing down on me, and I have not
 been able to get any more any but working capital
 and have not started looking for a job

[illegible]

while some outlines of the northern islands of Japan, Sakhalin, the Kuriles and the south end of Kamchatka, were added to these maps of Asia. The outlines are often very incorrect but it is quite evident what is intended. In nearly all early maps of this region which I have been able to consult, as for instance those of N. de Witt, I have found the south end of Kamchatka in approximately correct position. For instance, in the N. de Witt Expedition to Alaska, sheet at Uden the same year that Bering was in the region, a note which might well have been sent to the Admiralty reads: "I have drawn two charts of the parts of solar eclipses (Plates 10 and 11). On these charts the insertion of 18° from Petropavlovsk across what is unmistakably the south end of Kamchatka, though not Eastern Siberia, remains a blank." This I take to be a mistake at starting point and is quite as correct as the position of the island as it is a few miles of the coast of the peninsula, connected by two channels, would have been. I believe that was necessary to correct the error which at observing any lunar eclipses, probably the surveyor started with an incorrect assumption as Menzies's or De Witt's charts supply.

Notes on Contributors

The general history of China [etc.] Drawn from the French of [etc.], Doubleday & K. Brookings. London, John Warr, 1730 + v. 18. 27 with maps and etc.

This is referred to as the following text by the other B.

This is the first English translation from the original French edition of the *Itinéraire géographique et historique de Beniguet, d'Albani et de la mer d'Azov* by the late J. B. De Hader, published at the Hague in the same year as the above translation. The text of the original French I have not been able to consult, though, so far as Bering's voyage is concerned. There does not seem to have been any material abridgement in the translation above cited for an opportunity of acquiring which I am indebted to the Librarian of Congress.

The maps and charts of the original French exhibits were separately printed in no more than 1 conserved, for the use of those who might desire to do with at the feet, under the following:

Un grand Atout de la Collection du Cartier est l'absence, et du Titre et de tout Les Chartes générales de parution pour le pays, ainsi que la Carte du Royaume de France, de la Bibliothèque de la

M. D'Anville, Géographe ordinaire du sa Majesté très-
Présumée d'un voyage en la Russie, Par son Oublier d'Anville
qui a fait que je ne sois dans ce Pays. A la Haye, chez Jean
Schouten, MDCCXVII. Folio, 12 pp. 42 charts.

The chart of Bering from sheet 4^e and 5^e differs from the others in
being on Mercator's projection which indicates that it was copied
directly from an original sheet of the text was not redrawn. The
scale is 1 : 1,000,000 and is not shown and is omitted.

"Ils ont été traversés par le Ciel" there were 1 part in
vite le Tolush just as Kan-tu-shan.

Present the chart is made of four transcribed Russian terms for
100, 100, 100, and 100, with their French equivalents. The
original chart was in Russian and the original terms make it
clear that the original chart was in Russian and that the original term
was made by some one not perfect & familiar with both languages.
There are a few errors of the engraver in rendering single letters "r"
appearing for "p" and "r" for "p" in 4 & 5 places. The longitude is
reckoned in degrees east from Tolush to which 47 degrees were added
will give correctly the longitude east from Greenwich. The transcriber
of the chart from the Russian appears to have been a Dane, to judge.

That part of the chart east from 140° E. Gr. has been fairly repre-
sented by Leach, but it has the mistake of some to the north of
the chart and the whole of a signature in it is an ordinary autograph of
Bering. This is reproduced with a different running headline to
accompany the original translation.

The following is a list of remarks translated (pp. 20-21) from
the text.

"A short narrative of Captain Bering's voyage in
Siberia."

with a reproduction of the above-mentioned map, on which there is no
trace of the island of St. Lawrence, even its name which is on a page
on the Du Haie map, where it is also. The above is a version of the
map does not differ from Du Haie's more than one copy of a drawing
usually differs from another. When Bering started on his expedition
he was accompanied by two cartographers (Bering, First Voy. of the
Kass, p. 2-3, (de Lachmann) Lachmann and Pauloff, and to one or both of
them under Bering's direction the reproduction of the map in question
was probably made.

When Bering made his report it was accompanied by a list of places
and important places visited by the expedition.

Dr. Campbell, while gathering material for his second edition of
Harris' Voyages, procured a copy of this unpublished set of position
and prints it in his account of Bering's travels, with this comment that

it was sent by Hering from Kamchatka, before his return to Russia, and that the second, at St. Petersburg, for which Hering did not report whether it is to the manuscript or the printer, there are several very obvious errors in the list as printed by Campbell, and when it is compared with Derang's own list we see that there are also several omissions.

But the possession ascribed to the chart, and by Du Rade to have been brought to St. Petersburg by Hering on his return, a statement corroborated by the mention of a chart in the report itself, are not without value, for they were enumerated in the list. This tends to the conclusion that Hering's first chart was not published, and that the chart issued was due to a recalculation and revision of his data. This suggestion is made stronger by the statement of Lauridsen, who gives no authority, however, that Hering's chart was made in Moscow in 1781,* to which it may merely be said that some of the copies which were distributed to various persons were so prepared.

Three manuscript copies of the chart and report were sent to various foreign courts, as a matter of general interest, by the Russian authorities. The copy used by Du Rade was communicated to him by the king of Sweden who had received it as a "present worthy of his regard and curiosity." Du Rade ix, p. 478, Brookes ed. Other copies were sent to Sweden and primarily to England and other countries. In the journal, "Vinter" of the Swedish Society for Anthropology and Geography 1884, p. 93 is a report made by E. Dubugnon of three manuscript copies of Hering's chart of the first expedition, or rather of charts embodying its results. Two of these charts are in the Royal Archives of Sweden and measure 68 x 115 cm. One of them is ornamented with a colored drawing of natives of Siberia. The other is without these but does not seem to be a copy of the first, but has a number of shortcomings between St. Lawrence and the Promontory which are not on the former, and some others which are peculiar to it. Both have many more names than are given in the chart published by Du Rade, both of the original charts having a legend referring to the coast from the Kolyma eastward to the northern coast of Siberia, to the effect that it is not shown from our charts and not mentioned elsewhere furnished by the natives at Yakutsk. The third copy is in the possession of Baron Robert von Keferstein of St. Louis, Moscow.

Through the kindness of Baron von Keferstein and the generosity of Baron von Keferstein, the manuscript chart has been forwarded to the writer through the Swedish Consulate in London for examination. It measures 68 x 115 cm, essentially the same as the second of the two charts referred to as comprising the Royal Swedish Archives. The result of examination of it leads me to the conclusion that there were two different charts, one prepared by the Russian authorities. The first chart is regarded as the earlier and which is certainly more accurate, though the names of St. Clements in its printed place in accordance with Hering's report and list of persons. It formed the basis of

* Lauridsen, *Ant.* ed. 1, p.

* and well engraving which will be referred to later, and of the chart which appears in the various editions of *Ma Hilde*. It is possible that this is indeed the original chart prepared by Bering in Kamchatka during the winter of 1780-81. The second and probably later form of the chart is represented by the black dashed chart, upon which the name and island of St. Demetrius have vanished and a small island in the corresponding latitude is represented close to the Siberian coast and westward from the meridian passing through the east to extreme of East Cape. This island is named the island of St. Providence. If it is included as a revised position for the island of St. the series of the master chart and of Bering's Report, it is in conflict with the facts and with the position assigned to St. Demetrius in the report. No one who had sailed between St. Demetrius and East Cape could have sanctioned such a position for the island with honesty. If a different island is intended the question arises, Why is St. Demetrius omitted? This second chart is obviously the base upon which in D'Anville's chart of Asia (1778) the configuration of the eastern extreme of Siberia is based, and I suspect that the chart of the Imperial Academy of Sciences at St. Petersburg and the reproduction of Jodot's, were also derived from it as far as this region is concerned.

It would be rash in the absence of authentic information which only the Russian archives can supply, to hazard an opinion as to the origin of the important difference between these charts. I may return to this point later. Apart from this it may be noted that the northern coast of Siberia from East Cape west to Cape Shelagol is represented as rising along the whole length of coast. A legend states that it is taken from older charts and information. This relieves Bering from the responsibility for the fictitious or at least grossly erroneous and exaggerated form and direction given to Cape Shelagol on his chart. The west coast of the Okhotsk sea and part of its northeastern shores not visited by Bering are sketched by a line drawn from "informa mea."

As this is not drawn, the black square in the title left for Bering's autograph has never been filled. No notice of draughtsmanship or place or date or copy of these are noticed here. It measures 5, 16 2/3 inches between the front cover. It is a black and white reproduction without ink, the only copy being substituted as a conventional high for woodblock copy. A copy of the master chart fell into the hands of Dr. Christoph and was published by him in his edition of *Karte von Kamtschatka* (1794) page 107 with a version of the coast which is here reproduced and to which the following reference is made in the last

* *KAMTSCHATKA*. Cart. Géogr. ou Carte de Kamtschatka, par J. Le Fort, T. Woodward, and others. Paris. 1794. 16 pp. maps and plates. Vol. 2, pp. 1010-1015, is devoted to a description of Bering's discoveries within Kamtschatka. Section VIII. "A description of part of the northern frontier of the Kamtschatka Empire, as far as the boundary of Kamtschatka or Kamtschatka, during the voyage of Captain Admiral Bering for discovering toward the East pole." collected from the best and oldest maps printed and published."

added certain flowers of rhetoric which detract from its accuracy. Complete copy of the map is the most perfect yet published and the name of the cartographer is placed in its proper place.

The copy and those derived from it the eastern border of the chart has cut off the islets though in some of them, as in that of 1736, the name remains. The only fault to be noted in Campbell's edition of Delecluse's map is the omission by the printer of the small bay named *Prohemzaren* by *Barang* and which though it is not named, appears on the other editions of the map. The title is as follows:

"An exact chart of all the countries through which I have been traveling, from the island of Solor to the country of Katschanka."

The size of the map is 7 x 12 1/2 inches. It extends on the east to the meridian of 120° east from Toulouk water and on the "Isle of St. Demetrios" (our present Day Damp) to a point in a proper place. The nations previously reported have a table placed at the right margin, thus cutting off the table whose name sometimes appears and sometimes does not.

It will be observed that Dr. Campbell makes no mention of introducing the erroneous and unorthodox Germanized spelling of *Barang's* name into English literature. This is a pretty good subject in that he had no examples of erroneous form. *Barang* himself and his associates, in whose data he relied for a German sentence, or at least had been transferred into the German language. In his thorough record of the structure of the subject and lengthy description of the results Dr. Campbell undoubtedly gathered the fullest account of the first expedition which had up to that date been printed. In order to relieve his history of the proceedings, the good doctor occasionally rises to flights of fancy and the theories he held were long since proven erroneous.

There are several other English translations of De Halles's *Journal* of which the following is the most important:

"A description of the voyage to the island of Flores, Ternary, together with the Kingdoms of Kyren, and Tider, containing the History natural as well as civil of the same."

London, Printed by J. Streater, at the Sign of the Gun, in St. Dunstons Church-yard, 1711. 2 vols. folio, maps and 160 plates. With notes geographical, historical and critical, and other improvements, particularly in the maps, by the Translator." London, Edward Cave, 1711. 2 vols. folio, maps and 160.

This edition does not show the name of the translator but is obviously a work of no small importance as a geographer and cartographer and introduced numerous improvements and corrections into the charts of De Halles, which accompanied the original edition of 1694.

of New Hampshire in 1860-1, for an opportunity of
visiting him. I am indebted to the courtesy of Mr. Jordan
to have the following:

The text of the edition, compared with that of 1906, is as much as revised as it is agree. Yet contains nothing new in the original, but the minor alterations certainly are to be noted. This may be said.

"A Map of Capt. Bering's travels from Tolstok to Kamchatka between y^e years 1740 and 1741. With improvements by Mr. Kater." It contains the following letter by the author: "That Bering probably observed y^e Lat^d in y^e Principal places thro^{ugh} he passed the two observations only are mentioned in his Journal. But Mr. Kater was at Vlad of the Itchena before he reached y^e Author in this respect it differs as y^e former is more north, Yakutsk y^e more south, and Cape Medvensky y^e more south than Cap. Bering's, likewise other places in proportion. I have reckoned y^e Length of y^e Circle from Paris according to an Ephemeris of y^e Sun observed at Harbin and Tolstok y^e, mentioned by Mr. Sin, entering in his account of y^e Northern parts of European Asia. This is all that can be done till y^e return of y^e Russian Ambassadors next to make the observations and discoveries throughout Siberia." Then follows a line "Inscribed to Her Imperial Majesty."

The main body of the chart is that of Dr. Blagov's original and the scale is the same, but the length of the meridian is only 54 m. m. Bearing the line from Khatanga to Dudinka, across Khatanga northward to 60° 30' and his track eastward from Khatanga to 120° and around the peninsula to Dudinka and Ukhalsk, are indicated by dotted lines. The two latitudes noted in Bering's journal are indicated on this map by * and the northern one is passed near the Asiatic coast in latitude 15° E. from Tobinsk. At the top of the map two compass roses are indicated, a difference between Paris and Tobinsk being assumed of 70° degrees, which is about five degrees too much. There are also sundry indications in the translation of the map as from the French of D'Anville.

A chart which deserves notice, though almost wholly fictitious, being chiefly devoted to the spurious discovery of the alleged Adirondic route, was issued by J. N. de L'Isle with the concurrence of M. P. Bouché, or at his suggestion. It appeared at Paris, in 1793, and was signed for dealers' (the editors of *Voyages from Asia to America* in 1794). I do not know if this copy appeared in the first edition, but presume it did.

*in the sample, there are taken as east from London with an allowance of 8% between London and Tokyo

For present purposes the interesting features of this map are as follows:

Opposite the eastern extreme of the Chukotka peninsula there is represented part of America with the legend, "Terres vues par Mr. Spaulberg en 1728. Inscrites & present par les Russes, en en appuie d de trois Isles fourrées." In the English edition the legend is "Seen by Spaulberg 1728." Four islands are represented in the strait between Asia and America, corresponding in a general way to the four now known to exist there. Connected with America and north of the Chukotka peninsula is shown an island of a corresponding size next to Wrangell and Herald Islands, and marked "Discovered in 1792." It is possible that this and as a hypothetical continuation of the land reported by the Chukchi at east of the strait with that with which they knew to be visible in clear weather from Cape Yakut, more or less confused accounts of which had been current among persons and nations in these regions.

The next chart of note in this connection was published by J. Adrien de L'Isle, geographer at Paris, who had previously prepared the original map of Bering for publication. He issued a general map of Asia, in three parts, each of 40 leaves which could be joined together of which the first part appeared in 1771 and the third part in 1781 and 1782.

Tombeau Partie de la Carte d'Asie, contenant La Sibirie & quelques autres parties de la Tartarie. Publiee sous les auspices de Monsieur le Comte d'Orleans Duc d'Orleans Prince de France du Sang Par le Sr. d'Anville, Secretaire de Son Altesse Serenissime. MDCCLXXI. Avec Privilege.

This map is in two sheets each 21 x 21 inches, the geographical part by Jean-Baptiste de la Taysie and of the ornamental title by Les LaFolles. The longest side is reckoned from Ferro, and the scale is constructed on a basis of 20 French leagues to 10 geographical miles. The longitudes are reduced to the mean solar time of the meridian of Ferro. It is on a copied, not projected, map.

This map includes many of the additions to geography in eastern Siberia which were due to the discoveries of the great Siberian expedition. The courses and branches of the rivers especially were ascertained and corrected as well as named. The branches of the Anadyr River were represented as I named, but as no new information in regard to the coast had been received at that time, this river was still represented entering the sea to the south and west of Cape Thudlow, as erroneously and incorrectly Herby who confounded with the Anadyr a small river which does come in here, and passed the estuary of the true Anadyr without seeing it. The coast lines are essentially those of Bering. Inset 1 the basin of the Kolyma and Anadyr is marked "Terre inconnue", a small supplement in the north-east corner of the map, on half the scale of the map, represents the north-east extreme of Asia as delineated by Bering. This little supplement is of considerable interest as it gives fuller information than that which appears on the

The succeeding volumes have the running title "Sammlung Russischer Geschichte" with the number of the parts subjoined but no other title.

The account of the Russian Voyages is stated by Möller to have been prepared at the direction of the Emperor and authorized by the Academy of Sciences. It contains invaluable material on the early exploration, which, if it had not been for Möller's painstaking researches, would have been totally lost as the archives of Yakutsk from whence the original documents of Möller were subsequently destroyed by fire. The errors which occur in it are entirely due to Möller's endeavor to make the meager geographical data of the *Primyecheniya* and *Chasovniki* or comparing them with the less accurate but more precise observations of later observers. In this attempt he added many valuable details to the charts, but at the same time introduced several errors. The exaggerated distances reported by the first explorers who were unable to correct their estimates by observations of precision, distort the parts of the map due to their reports. The peninsula of Alaska becomes more exaggerated as does the extension from Europe on the Arctic Sea. But no copy, I feel, person can read Möller's account without perceiving the great care and unswerving unserved by some imperfect contributions. The reader is entitled and is bound while he must be cartographer the presentation of the facts which he received from others and his desire to be fair to everybody.

The introduction of a charge of a desire to injure Peking by means of two passages given by Möller, which Lauridsen attributes to the latter appear to be entirely the product of a suspicious temperament and an excited imagination. I have seen nothing anywhere cited which tends to establish any fact of probability. The facts cited in support of them can easily be otherwise explained. I am desirous to show the subject justly, and for the most part are not yet thoroughly understood by the latter author.

The error upon which the latter lays great stress, is due to a manipulation of the records originating at least, according to Peking himself and which is incorporated in the latter's report which I am not prepared to condemn directly from her own account.

The most map of importance was issued by the Imperial Academy of Sciences, St. Petersburg, in 1814. It was done under the inspection of Bernhard Friedrich von Sieber and is corrected and corrected it subsequently, was in 1820. It was issued. The map comprised the geographical results of the great Siberian expedition sent out by the Russian government of Peking's voyagers and of the records of the hunters. From *Primyecheniya* and *Chasovniki* were presented in the archives of Yakutsk. The account of this map, and fully explained by Möller in the "Russian Travels" (St. Petersburg, 1854) I have not been able to read the copy of the original map, and have therefore relied on the English version of it which is to be found in *Jefferys' Russian Empire*, London, 1845.

his name was listed at Copenhagen in 1754 as a part of a volume relating to the other explorations. In no previous book, or have been puzzled by the misnomers of a title, not recognizing that for St. John Jefferys was intended for a title of a name. Another work, the journal of the expedition of the *Arcturion*, under the general command of the expedition eastward by the Russians, was published for the publication of Vits, Rev. William to be in 1780. This was followed by a second edition during the same year. A third edition accompanied by a Supplement of 7 pages was printed in 1787 and a fourth in 1801. There were two apparently distinct editions of a book printed at Paris in 1811 and a second edition at Frankfurt and Leipzig in 1832. The third edition, which is the best of the work, appears both in octavo and quarto for a and is that to which reference is made in this paper. It is small.

3. Account of the Russian Voyages between Asia and America. To which are added the Conquest of Siberia, and the history of the transport and commerce between Russia and China, [etc.] London: T. Cadell, 1787.

4. 100 pp. (or 4), with four charts and one plate, to which is added a second 100 paged.

5. A comparative view of the Russian discoveries with those made by Captain Cook and Clarke, and a sketch of what remains to be ascertained by future navigators. London: T. Cadell, 1787. 4 l. 10 pp., 4 — 450 pp. 8.

The latter was also separately issued. Among the books contained in this work of Cook's are a map of the coast of Russia made by the Imperial Academy of Sciences at Petersburg, 1766, and a chart of Syld's voyage toward Chukotka Bay.

The latter is not only a chart of Syld's voyage, 1766-70, which is a voyage, and it is a good one as an author by Dr. Cook's compared with the charts of the course actually taken by the expedition, but it is a rough one, it does not seem to me to be so good as to recognize what was intended as many as it does. In the particular part of the chart.

The islands are exaggerated and the boundaries contracted in a very unreasonable manner. Nevertheless we recognize that they have named.

From Tchukotka Bay the sea now called the Bering Sea but here left unnamed, a large island, moved eastward out of place and doubtless intended for Arakawa Island is called "I. By name" while among a crowd of islets referred to the bay of St. Lawrence Island seen through a fog and described as "very low", the name "St. Lawrence" appears. The American coast was seen and named.

No trace of Wales and the shore south and east from it are recognizable. The island of St. Matthew was discovered and named though placed a degree too far south. The island of St. Paul in the

Pribilof group was discovered by Syrd, put in its true latitude, and named Preobrazhenia or Transfiguration Island. It is about seven degrees east in relative longitude and fourteen in absolute longitude. One cannot doubt however that it was the island now known as St. Paul. It was we recall the fact that there are no other islands than the Pribilof group, in that latitude or within that general area of Bering Sea. The southern Cape of the so-called Pribilof, Chukotsk, Cape of Bering and Miller is represented two degrees too far south. Preobrazhenia Bay is not recognizable but its name is transferred to the light west and north of Cape Bering of our present charts. This part of the coast was not however approached by Syrd, who spent much time on the coast of Kamchatka. On his chart this peninsula is represented better than we should have expected from the reports of the rest.

The map of the Academy shows the influence of those who discredited the first approach of America to eastern Siberia notwithstanding the experience of Bessel, Gmelin and Syrd, the American shore of Bering Strait has disappeared altogether. The eastern portion of the Chukotka Peninsula is indicated as a host of hypothetical islets, and defended by an imaginary chain of imaginary islands. The imaginary chain of islands, among which Bering's second expedition was so long engaged, excepting those mentioned by Krusenstern and Laxman, who sailed far north of the southern part of Laxman's is also omitted. Excepting the distant peninsula north from Chukotka, it is indicated that it is its main features for this region is less accurate than that of Bering and does not compare very favorably with that of Laxman. And yet but shortly after its publication, the experience of Cook and Burke recorded the facts which would, when published, exhibit the accuracy of the other geographers and scatter the hypotheses which for a time prevailed against them.

Their experience is given as follows:

"A voyage to the Pacific Ocean, undertaken by the command of His Majesty, for the purpose of surveying the northern coast of America, under the direction of Captain Cook, and the Mapping of the Coast. Result of the voyage, in the years 1771 and 1772. Part II, for the Strait of Tschukotsk and the Gulf of Kamtschatka, as far as the 54th degree of latitude is taken."

It is as the work ordered by the Admiralty. Of the whole voyage work seems to have been written from the original manuscripts by James Cook and there have been many editions. In the first of the numerous geographical Publications, No. 17, 1781, is a bibliography by James Cook.

It is interesting to see by reading Cook's reports that many of the Bering Strait are comprised on the coast of the (p. 467) entitled,

of Aaron Berg and 14 other early cartographers of Eastern Siberia. It is a translation and of a paper published in June of 1895, in which four maps accompanied the text and are well illustrated.

of some excellent studies by L. C. C. & O. S. in describing the 4 species of jumping spiders (by Peter Loven, etc.), Richard L. the author and his sister from the Danish by J. & K. Olesen (etc.), C. L. L. & S. C. (Lorenz & C. Lorenz, 1980). P. xvii, 223 pp., 1 vol., 1 of 100 copies of each.

[illegible]

Wallerstein, Immanuel. (1976). New York, vol. 3. No. 1, 73, p. 434
 [http://www.]

I have also had a number of references to Kasaan articles from one of last year. He found in my bibliography of charts and publications relating to Alaska and a recent region, published by the U. S. Government in 1970.

I remained with the rest of the party near lunch just below the Forest, because no I think there are few houses and no access to the other side involved in a winter, going to Yak-tak, from the debris of the transportation the deep snow and the severe cold which prevented us from proceeding.

[illegible]

On the Tuzovka, I found some traces to the Y. can. but the enclosed Tuzovka, which was now surrounded with the same dense spruce forest, which I saw when I had it cleared, appeared as a grassy meadow and forest in a lower stage of development. There were not good signs.

From the fact
considering the fact that the
the land on both banks has been taken up in some or
the region. The Yakuts possess much of cattle, plenty of horses
and some horses, and they also possess a considerable number of
domesticated deer and horses, but they do not have a
other than the use of the bow. They pay no taxes and are governed
the same and are not subject to any laws, but they are not
a town. They also have a great number of their own articles, but
known here, such as *shagun*, and of *shagun*.

46 **106** **107** **108** **109** **110** **111** **112** **113** **114** **115** **116** **117** **118** **119** **120**

dark where but little in the way of illumination was obtaining as soon as the water. The crossing of Yakutsk might only be reached with great difficulty, but if successful the expense would be less than if the material had been carried on the backs of horses. I myself and a few people crossed from Yakutsk to Okhotsk with pack horses, as is the general custom. The load or pack taken is only that of five packs to our horses, less than by the regular route. The deep mud and high mountains to be traversed in a fortnight made, I judge, my supplies amounted to that point. At the post on the Okhotsk is a Russian village of only ten houses, and the rest of our staff was left to winter at Yakutsk with several hundred men and the whole of the post in the spring.

In the last days of December, 1879, a messenger asking for me was received from Lieut. Semberg, who, on being detailed by the mayor, saying that the boats had failed to get within 400 miles of Yakutsk and were frozen in the Irkutsk River where he was transporting by sleds a number of outfit independent outfit parties. I sent at once some men and those who were wintering with me at the post of Okhotsk a party with dogs and supplies and horses to the Lieut. went to the post on the first day of January, 1880, and without any of the outfit he having left the Irkutsk river November 4th, 1879. He returned with two sleds, by his party sent the flesh of the 10 horses and even the rawhide harness, the skin of his fur clothing and the harness. He was a little at fault in the way of the outfit, but by the way he was able to secure, with some of our own dogs to the amount of 150 miles, what on my overland journey I had been obliged to leave at Yakutsk. I crossed the river and of my two horses.

Along the river Altai and Yenisey Yakuts of the upper stream as those of the Lena and Yenisey rivers. In the near and present of the Okhotsk was the whole of the river. The river and the sea were the same as in the last century, when the river was a great and summer were there were some four castles; and some pedestrian villages who live on the sea and rivers and along the Yakuts.

February 1, 1880, was a fine day and the dogs were out at the post. The post Semberg to bring in the outfit left at the end of the Yakutsk river, and by the 1st of April about half

of 6 has been transported mainly to Thailand. Since more than
half of the twenty seven men to whom I was referred were
in fact of the number as on page 1, some doubt as to page 1.

From Yukuk to Okhotsk and other distant places people always travel in boats or parties of eight or ten, hauling their own sledges after them. There is no dog team or common law set from Goshima to Oshirishka. In the winter of 1891-2, the snow being seven feet deep in places and very low in winter being a good deal melted up every evening, down to the ground to keep warm.

It is 300. Lieut. Spangberg has a way but it is very bad indeed. The sea is the part of the harbor with a strong wind and a high place and the bottom of the ship is there and we have to go for a good, set to Kanchikua to get out the bottom for a vessel, being ordered to return now it is 4 p.m.

July 11, 1964. I picked up my car from Yessak with 2000 yms of flour, according to my instructions.

August 21, we loaded the new vessel with and returned from, the lot of kamchucka, and another set of boat which had been at Shesborsky with the first, and the whole continued then as before as proposed across the sea to Kholmsky. The cargo which had been left to guard the provisions which had not arrived from the wintering place on the Turukh river was directed to that place and we again took a receipt from the authorities at Turukh and on our way, the following year, to deliver to the same place and to have taken some part of the provisions, returned to

It was necessary to take the supplies from the mouth of the [Kolyma] river to the post of Redchertsk by water in summer months. At the post were African houses inhabited by Russians for the reason of the shallow river which boats had been by, and I feared that the outfit and the most necessary part of the provisions should be transported to the upper Kamchatka post, as the [Kamchatka] water. The transportation between Redchertsk and Uppot and Lower Kamchatka in winter was entirely carried on by the use of the native dogs. Every evening it is necessary to dig out the camp in the snow, in order to get shelter from whirlwinds of snow which in this region are called *porogye*. The [Kamchatka] dogs are not able to withstand the [Kamchatka] squalls are able to overwhelm the party and they may perish.

At Upper Kamchatka there are seven towns and at Lower Kamchatka fifty houses, at no other place [Middle Kamchatka] where there is a church and fifteen houses, and in all these settlements there are not over 150. It seems probable that the majority of the *Yakutsk* trip to Kamchatka, but for those who were brought to the country on their expedition.

In coming over to Khabarovsk we brought 400 pounds of walrus blubber obtained from a walrus caught by the sea, which served as our money, together with the Circassian tobacco which is here commonly used.

In the southern part of Kamchatka live Kamchats, in the northern part Kamchadkians, whose language is peculiarly their own with but few introduced words. Of these people some are hunters, others believe in nothing and are strangers to all honesty. The Russians who live in Kamchatka are few and games grow scarce and have no domestic animals except draught dogs. They live and subsist upon what they can get, principally deer, roots and berries, in winter eat some wild fowl and large sea birds. A present in the wilderness of Yakutsk, the reindeer, was about the same age as the Kamchatka reindeer, and makes heavy meat and strong. Here only tundra are grown by the people of the three settlements, but they grow very large, in Russia they are small, here there may be four times as good. I found with me on my journey some rice which was sown around the eschschscholiar near us, but whether it ripened or not I did not ascertain. The frost strikes early into the ground in this region and the snow

falls in great quantities for the people to plow.

The reindeer herds are much smaller than in Yakutsk, probably on account of the long time the Russians have been hunting and using them. They are known for several years and had passed on. If a man has any animal brought back to him, or one of them is shot and sold for four or five rubles, and it is regarded as a great fault if he does not shoot or sell one of the two.

The Kamchadkians are very superstitious. If a man is sick or ill, or very ill, a father or mother, or near the point of death, they will carry the man out into the woods and bury him without any shipment for a week together with other things for the summer, from which treatment many die. The dead are not covered with earth but are dragged out and left to be eaten by dogs. The bones of a man who has died is a great deal. Among the Kamchats people it is the custom to burn the bones, although this is forbidden.

By the time of *U*'s arrival at the Lower Kanchakka post the carpenter for our vessel was in large part prepared, and upon the 4th of April, 1888 was put upon the stocks for the vessel, which, with the *Pelican*, was launched by the 10th of July, the former having been built by *U*. The masts were made from the native tree which is called *Louchea kappoo*, since the tree which we commonly brought with us had not arrived.

But he did not want to let her see that it had really been so. From the native house, the place for the winter stage, the doctor, of spirit, made for a garden was supplied by a large, round, flat basket, and salt was raised by boiling sea water. The increase in the store of sea provisions, a pile of cow's fat, and a fat was the first indication of a new life, was raised. The vessel was then visited with everything given. I for forty men for a year. On the 14th day of July we went out of the mouth of the Kamchatka river into the sea, in one piece of the native ship, one of the

By his Imperial Majesty's order the Council, in the name of the Emperor, has directed for that purpose with you.

They set sail, having arrived in northern Alaska at 10:00, and did not return to us from the shore as scheduled, supposing that whence we came and what was our business there. They said they were Eskimos, who in the Russians of these parts have no name, and as we lay there they were unable to come to the vessel. They killed some fish and made a seal-skin and sent one man swimming to us to inform that the boat came up to the vessel and they came to it on the coast near mouth of the Plover Bay. On the 10th we left from there taking good good care to the westward and did not see any land till 10:00, and then for the first time we saw some

at about 11. There are no trees, but it was made to all things with the
up on the except boats. There seemed to be no one there, but we saw
at. However, we had to wait a bit there to see why people had not
possibly the officer was sent to the bank from the vessel and the
so we took it on and the boat.

On the 11th of August we removed our quarters to 60° 15' N. and 172° 45' W. and having a light breeze at the start, we were overtaken by the Imperial Majesty of gales and never observed in safety. Therefore the ice here is extended to the north. Very often the land can be seen from the eastward coast and extends to the westward coast. If we had a steady wind our course would have been unobstructed and we would have been to Kamchatka before the close of August and our trip to

obliged to winter in that region, not only without a harbor, but where no fuel could anywhere be obtained, where the native population did not acknowledge the authority of the Russian government, but were wholly independent and acted against us as refusing to pay tribute.

From the mouth of the Kamchatka river and all the way to the place along the sea coast where elevations, mountains, and a wild and desolate, and for the most part snow covered, desolate

On the 20th of August four canoes were observed to have towed us, containing about forty people who were Chukchi of the same sort as those whom we had met before. They brought for sale meat, fresh water, fish, &c. &c., of which fish were of the white fish and four walrus teeth, which my people bought for the fur most of us and for the walrus. They said that some among them had been captured with reindeer to the Koryak coast and that they never went by sea to the Kamchatka but, as a great distance, by the season, and some of our people, from Russia, told them when they had known for a long time, and one of them said that he had been at the Anadyr coast to trade. To all our questions they gave the same answers as the Chukchi previously seen.

On the 2d of September we entered the mouth of the Kamchatka river and wintered at the post of Lower Kamchatka.

On the 5th of June, 1804, having repaired the vessel which we had built up, we went out of the mouth of the Kamchatka river and put to sea to the eastward, because the inhabitants of Kamchatka believed that a fine day land could be seen across the sea. Though some of our own people had observed it, we went out to determine the authenticity of the information. We sailed for nearly two weeks and saw not the slightest trace of land. We sailed hence to the point of Kamchatka to the mouth of the Red-shore river, making the rest of this part water land as previously noted. From the mouth of the Red-shore river we sailed to the post of Ukhotsk having left at Lower Kamchatka and at Berdsk, all of the supplies received by us from the authorities of Yakutsk, flour, meal and dry goods, and to the receipt of supplies.

On the 2d of July the vessel reached the mouth of the Ukhotsk river, where the outfit and supplies of the expedition were turned over to the governor and left with my command, on

It will be noted in the following tables there are a few discrepancies of single days compared with Lauridsen's account or other authorities. These I take to be due to the use in the ship's journal of the nautical day in which the nautical second day of the month begins on the first calendar day at noon and ends at noon on the second calendar day, so that events occurring during the first twelve hours of the nautical day would have a date one day later than the true calendar date.

Obtainer of the towns and notable Siberian places put on the chart through which the route passed, with their latitude and long. true, the latter computed from Tobolsk

	Long. E. of Tobolsk	
Yakutsk	40	0
Verkh. Khatanga	45	5
Yukon	47	11
Yukon	48	17
Yukon	49	23
Yukon	50	29
Yukon	51	35
Yukon	52	41
Yukon	53	47
Yukon	54	53
Yukon	55	59
Yukon	56	05
Yukon	57	11
Yukon	58	17
Yukon	59	23
Yukon	60	29
Yukon	61	35
Yukon	62	41
Yukon	63	47
Yukon	64	53
Yukon	65	59
Yukon	66	05
Yukon	67	11
Yukon	68	17
Yukon	69	23
Yukon	70	29
Yukon	71	35
Yukon	72	41
Yukon	73	47
Yukon	74	53
Yukon	75	59
Yukon	76	05
Yukon	77	11
Yukon	78	17
Yukon	79	23
Yukon	80	29
Yukon	81	35
Yukon	82	41
Yukon	83	47
Yukon	84	53
Yukon	85	59
Yukon	86	05
Yukon	87	11
Yukon	88	17
Yukon	89	23
Yukon	90	29
Yukon	91	35
Yukon	92	41
Yukon	93	47
Yukon	94	53
Yukon	95	59
Yukon	96	05
Yukon	97	11
Yukon	98	17
Yukon	99	23
Yukon	100	29

*These longitudes absent from Lauridsen's own report are added and are probably from the chart.

In the Table of positions the addition of 6 will reduce the longitudes to E. of Greenwich. It is possible from the table at the (provided) distance of 1st, in starting, which is bearing

ITINERARY FOR BERING'S FIRST EXPEDITION

Dates converted to ordinary calendar, beginning at midnight

Place	Latitude	Date Old Style	Date New Style
Admiral's party under Chirikoff left St. Petersburg	H. L.	Jan. 24	Feb. 6
During passage	H. L. M.	Feb. 5	Feb. 17
Bering arrived at Tobolsk	H. L. M.	May 1 st	May 13
Left Tobolsk		May 15	May 27
Arrived at Irkutsk		Sept. 20	Oct. 2
Left Irkutsk		Oct. 1 st	Oct. 13
Arrived at Yakutsk	L.	Nov. 3	Nov. 15
Left Yakutsk	L.	Aug. 16	Aug. 28
Bering reached Okhotsk	L.	Sept. 19	Sept. 31
Bering's ship and train arrived at Okhotsk	L.	End Oct.	Nov. 1
Spotsberg reached Okhotsk	M. H.	Jan. 1	Jan. 13
Spotsberg sailed for the Amur river	M. H. L.	Jan. 31	Feb. 12
Spotsberg arrived at Okhotsk	H. M. L.	July 9	July 21
Spotsberg returned with Fortuna	L.	Aug. 11	Aug. 23
Bering and party sailed for the Amur river (Lauridsen says August 19)	H. M. H.	Aug. 21	Aug. 33
Bering arrived at Tula on river	M.	Sept. 2	Sept. 14
Bering arrived at Khabarovsk	L.	Sept. 4	Sept. 16
Partial eclipse of moon visible in this region, beginning at 12 th M.			
P. M.	October	Feb. 14	Feb. 26
Bering arrived at Lower Kama- charka	L.	March 11	Mar. 23
Left Kama-charka on the stocks	H. H. M.	April 4	April 16
The expedition launched 12 boats sailed to the mouth of the river July 9	H. H. M.	June 10	June 22
The expedition left the river July 1			
The expedition sailed northward	M.	July 14	July 26
Bering reached his northernmost point and started on his return	M. H. H. L.	Aug. 15	Aug. 27
They reached the Kamchatka river on their return	H. L.	Sept. 2	Sept. 14
Partial eclipse of the moon visible in this region, beginning at 12 th M.			
A. M.	October	Feb. 2	Feb. 14
Bering sailed from Kamchatka river (Lauridsen says July 10) and sailed	M. H.	June 5	June 17
During passage to the south west	L.	June 8	June 20
The party arrived at Khabarovsk		July 2	July 14
Left Khabarovsk			
Bering arrived at Okhotsk	M. H.	July 2	July 14
Left Okhotsk			
Total eclipse of the moon shadow seen at Khabarovsk in part of Amur		July 29	Aug. 10
Bering arrived at St. Petersburg	H. M. H. L.	March 1	Mar. 13

some additional errors, and misstatements, can be the same. As Clarke does not give any longitude for Lower Kamchatka post it is highly improbable that he observed it at that place, by means of a lunar release or otherwise.

Clarke's observation of a lunar eclipse at Lunsk made that point about 13° east longitude from Tobolsk or, approximately, 97° E. east from Greenwich. His old lunar observations placed Lunsk on 106° 44' E. but the recent charts place Lunsk on about 104° E. or, so that the eclipse observation was in error about 2° degrees. The most observation on the voyage of 1728 was that of Lower Kamchatka, based on geodetic observations from Ilinsk computed by means of a traverse table. These, according to Clarke's notes, gave for the Lower Kamchatka post a meridian of 116° 41' 49" east from St. Petersburg or about 103° 42' east from Greenwich, which is in error about 20 minutes of an arc or 2 degrees. Descending to release observation and using only the geodetic observations from Tobolsk to Lower Kamchatka the result for that place is 115° 53' E. or, which is very near the truth. I have no doubt that this result was actually used in the chart (though not in the original report) and, therefore, that in the observations of Larionov and others as regards to the alleged eclipse in Kamchatka are based on a misundersanding and with a false

SYNOPSIS OF THE VOYAGE.

The rates are not tied to the time mentioned from the original account. The longitude is stated in degrees east from Greenwich.

June 1-2, 1728. A vessel, which was named the *Grigorii*, was launched at the Lower Kamchatka Port and loaded with provisions and supplies of provisions for forty men (134-113). It was named the fastest boat used in the boats.

Voyage. This vessel was composed of the Kamchatkan people, a species resembling the Eskimo people of the north. There is a great number of species of *Arctostaphylos* and *Arctostaphylos*. The first of these two species the first day in their supply of food or food was made up. The trapping of the fish, salmon and other fish had been transferred with great labor from Tobolsk. The packing and the food were found to be fastened with iron and not with nails, and the amount of iron used was not as great as it would be in a common vessel. The provisioning of the expedition is the subject of a fanciful paragraph garbled from Berens's original report, which

It is not clear from Laxar's account whether in the above list are or are not included the two boats, *Robert* and *George* mentioned by the cartographer. But both were started with Hering from St. Peter'sburg. Laxar was left behind being ill.

July 13-24. The variation of the compass was determined to be $19^{\circ} 14'$ easterly (L.). In the afternoon being the 24th (actual reckoning) the vessel left the Kanichuk river (H. C. II). They started to the northeast along the coast, which was kept to sight to the north and west, from noon to twelve o'clock the next day. As the point of departure Cape Kanichuk was entered it was found to be 69° north latitude $67^{\circ} 3'$ (M. I.).

Notes.—The variation of the compass in 1885 was $2^{\circ} 30'$ easterly (which, as will be seen by the Table of Position, is a latitude above given for the purpose of the observations adopted by Hering in his chart. The depth mentioned shows that the sailors must have kept within a few fathoms (about 5 or 6) of the shore, from the shore and the vessel were probably then—as indicated by the log, and much more—being two miles apart, giving rise to the suspicion that, in the early part of the voyage, in order to keep the vessel from drifting, they probably may have used the current of anchorage. Of Khatamski's actual determination of the current one was determined to be the same as at the mouth of the Kanichuk river.

From this date to the 27th the preceding authorities give no data, and the exact position probably remained as was unascertained.

July 27. This day a prominent cape was passed at a distance of some three miles. [It was named St. Thaddeus, after the saint on whose birthday it was again seen on the return voyage.] Many granite, porphyry, and scoriae and scoriolites were seen (L.).

Notes.—This cape St. Thaddeus is not the cape of the same name on modern charts, but the cape now known as Cape Navarin. This is evident from Hering's chart. Hering's position for the cape is in error about fifteen miles in latitude and three degrees in longitude. His chart, which in the list of positions, the error is only about five miles in latitude and half a degree in long.

From Cape St. Thaddeus Hering stood across the Gulf, out of sight of the coast and missing Anadyr Bay and thereby incurred the error of placing on his chart the mouth of the Anadyr River south of the cape. This error was subsequently corrected by G. F. Miller.

Laxar's observations (American edition, p. 30) of not having an accurate point the Anadyr River without quite being able to find their bearings in regions of which they had not a single astronomical determination.

etc. This is absurd. They had a compass and there is no reason why they should not verify their bearings, and it is certain they were there to make observations and not to verify those already made. No apology is needed for Perring's determination to press on to the northward. It was a man of sense with common sense, considering the lateness of the season and the uncertainty of what they had to go through before the season closed.

Aug. 11th. Festival of the Holy Cross. The expedition saw land to the northward and soon after entered a great bay which they named Holy Cross Bay. Thus they explored to the river at its head which they named the Shok (Great) River, and on the western point of entrance the latitude was, Aug. 21st, observed to be 57° 11' north, and the longitude by dead reckoning was estimated at 152° 15' east of Greenwich, and the magnetic variation $\frac{1}{4}$ of a point easterly.

Atka. Laurben says p. 8. "As we arrived from Chukotka Holy Cross Bay the natives spent two days in search of fresh water and a place to anchor." This is extremely singular, as there is an anchorage immediately at the entrance to the bay, on the starboard side, and runs of fresh water are abundant. The application of an obvious correction* to the list of places given by Campbell makes the position at the western elbow or spot at the mouth of Holy Cross Bay, that which is given above. This position is over a degree too far west and over six miles too far south. But Laurben, quoting Campbell without observing the blunder, not stating the source of his information, gives a position N. Lat. 62° 50' which is two hundred two miles too far south, and the English translation is given upon this by making it 60° 50', or three hundred and thirty-two miles south

* In *Journal Voy.* 2d ed. i. ii. p. 101. Perring's table of position is printed.

<i>Archevêque Kamichutak (chief),</i> N. Lat. 58° 31' Long. E. 106° 00'	
The Mouth of the river of the <i>Apoude</i> <i>Tha-tou</i> am, the Cape . . .	58° 02', 106° 11'
The Elbow of the river <i>Sivot</i> <i>Krest</i> . . .	62° 20', 111° 02'
Eastern Point . . .	65° 05', 115° 16'

This should read errors and mislabeled or be corrected

	lat. long.
Nizhni Kamichutak (chief)	58° 11', 106° 00'
The mouth of the River Kamichutka	58° 02', 106° 11'
The cañon of the <i>Amou</i> <i>Tha-tou</i>	62° 20', 111° 02'
The western cape or spot of <i>Sivot</i> <i>Krest</i> Bay	65° 05', 115° 16'

The words in parentheses are added by the writer for clearness. It is somewhat surprising that in using this table nobody seemed to have recognized these errors.

Account of the Voyage of the "Hesperus"

of the truth, or two hundred and sixty-five or less and 1 of the entrance to the bay as plotted on Hering's own chart.

Aug. 23 to 25. On the 23d and 24th Hering and his party moved by 11 A.M. to a bay in each case fifteen miles in longitude and two degrees and twenty-five to thirty or nearly seventy-five miles in latitude. The chart is the more correct, but it differs more in latitude than in longitude and nearly a degree in longitude from the observations of Luke and Herges for the same locality. After leaving Herby Bay the voyage was continued to the southwest along the "high and rocky coast" of which Lauridsen probably misapprehending Dege's words in "every direction was very carefully explored." There is obviously a lack of fancy, snow a good part of the coast is low and sandy where there is no indication of two excellent harbors which it affords, on any of the charts of Hering or his successors in that century.

Aug. 26, 1854. They saw the foot of the Transfiguration, and the trail of entering a small bay, which on that account was named Trushig-raton (Frederick's bay) Bay. Here they observed (L.) Lieutenant Cuyper was sent ashore to get water and food native people to help the party.

Note. This bay has never been discovered and on the best modern charts is merely indicated where on a map of 1854 it is omitted altogether. The bay is transformed to the same shape north of Cape Hering or to Flavel Bay—Dege's position for the bay is the entrance of Transfiguration Bay at two degrees and a quarter too far east and sixteen miles so far north by latitude, but his chart gives the position more nearly close to with a difference from Herges's chart of not exceeding five miles.

Aug. 27. They proceeded along the coast in a north-south-easterly direction.

Note. The only glimpse of the mouth of this bay can hardly have been observed by Hering, since the sun's shadow must have been cast to the westward and first contact of the shadow occurred only about five minutes before sunset. As sailing was not mentioned it is probable that they did not see the bay.

Aug. 28. At seven in the morning a small vessel (which was observed to be a whale boat) from the north, came getting into it and rowing toward the vessel (L.). They approached within 200 yds. and were approached through the aid of the Kariak interpreters on board the boat (L.). They asked the vessel came and what was the object of the expedition in entering these waters. After much persuasion one of the natives left the skid boat and swam, sustaining himself on the inflated

and was taken by a party of five Chukchee and came on board and conversed, saying that his name, he told him, was the vessel shortly afterward (M. B. 41). The interpreters had some difficulty in understanding all that was said, but it was gathered from their conversation that these people called themselves Chukchee by an indigenous name, that they were acquainted with the Russians, by report of others, and that there were numerous settled people along the shore, and the Anadyr River lay at the west (42), that to the south and east lay the islands which would soon be visible to the people on the vessel if they continued on, and that they were not steering that in the vicinity of the island the shore of the mouth of a bay changes its direction in order to have it to the east and then to the westward (43, M. B. 44). The man who had boarded the vessel was given some presents and sent back to the native boat, and reported that he would persuade his countrymen to come on board the vessel, but, was not agreeing with his design, for natives pushed away toward the shore and kept pushing. Assuming to be told Lieke's journal expresses regret as to more important information not being obtained owing to the difficulty in interpreting what was said by the Chukchee. At least the natives were determined to be satisfied. In the afternoon the canoe mentioned by the Chukchee was seen.

NOTE. The box and given in Bergh's report and variously translated by Michx. Lichke (Caucasian and others), differs somewhat from the original given to Lieke for a journal and described by Bergh and Lieke as such. The name Lieke's vessel used both for the boat and for the canoe is not printed in the interview with the natives which was, that it was a Chukchee, but it can consist of changes in direction of the canoe to the north and west. These changes are noted for the vessel for a party on the shore and their account is not to be taken as every one's word.

The people of this part of the coast are termed as *Tschukchee*, which is a local name. The ancient name of this part of the coast being near the Anadyr River has been corrupted into the word Chukchee. By the name *Chukchee* from which we derive our general name for these people Lieke mentions "Bergh's map 41" which is the Anadyr River. The name of the river was 41" at the original and a little more to the right and the latitude 41" 41" was given. The name of the river was 41" and it has been a little different from the original. The name of the river has been 41" and it has been a little different from the original.

On Lieke's chart it refers to the point of the coast where the shore is the most direct or the most direct. The name *Chukchee* is the name of the river and the name of the river is the same as the

Chukchi Cape of the Anadyr Cosacka, was as he imagined the eastern extreme of Asia, which they knew from report not by the voyage of Bellinell. There can be no reasonable doubt that Herzing was right here, after the people who had described it to him, although the imperfect

resources leave doubt to be inferred. Herzing's map gives latitude as the extreme of the cape as about $61^{\circ} 02'$ and it is erroneously represented as extending south of the last side of the northwest end of St. Lawrence Island. Its real width is about fifteen miles farther north. Cook made it $64^{\circ} 13'$. Chukchev's journal according to Lauridsen makes it $61^{\circ} 15'$, which would agree with the latest surveys were nearly enough the coincidence must be regarded as a happy accident on cause of their imperfect land instruments and methods. Herzing's report places its eastern extreme in $61^{\circ} 35'$ and wrongly in the same longitude as the western end of St. Lawrence Island.

Aug. 10. St. Lawrence's day. The island referred to by the Chukchi was seen at the vessel's anchor toward it, about two miles in the afternoon. Twice, an officer with a telescope glass was sent to reconnoiter the coast more closely, but he saw only what appeared to be hills without indicating any. The island, of which only the northwest part was seen, owing to the hazy weather, was not after the publication of the day and the course of the vessel was changed to the northward.

Aug. 11. At noon the latitude was estimated at $64^{\circ} 20'$, and at sunset an attempt was made by the determination of the magnetic variation to get the longitude.

Notes. An estimation of the want of care with which Lauridsen has weighed his observations it may be pointed out that he claims $5^{\circ} 30'$ latitude from the meridian to be $64^{\circ} 20'$ the *latitude* was in being struck within two miles later, on her return and was I believe secured her to have got out of the strait on reaching latitude $64^{\circ} 25'$. As a matter of fact, at the present day the waters and traders of this region consider that Cape Chukchev was commonly known as Induk. It was from the southwest point of entrance to the strait and this point is situated in latitude $64^{\circ} 25'$ and longitude $167^{\circ} 40'$ as determined by the writer in 1886. It is perhaps the point referred to by Bellin as the eastern extremity of his Chukchi Cape.

The magnetic method of determining longitude would give a result which is only approximately as previously explained. The result announced by Lauridsen for the present occasion is $35^{\circ} 31'$ east from Lower Kanchasun at $167^{\circ} 51'$ east from Greenwich, which would be within a few miles of the actual determination. But it is not clear on these data how they have made this position more than about from Lower Kanchasun on the position above given or perhaps on other authorities from modern sources, which has been repeated or transmitted. As Lauridsen has particularly

at its middle in a specimen of Bering's original to determine who is responsible for the inaccuracy. An interpolation seems the more likely since Bering himself gives the longitude as $152^{\circ} 55'$ E. or *.

Aug. 12-23. From noon of the 11th to noon of this day, the land-ice was 1 sixty-nine miles, but the distance of latitude was only 21 miles. The wind was light to fresh and the weather overcast (H.)

Notes.—If the above statement be taken literally with the assumption that they were at noon of the 11th in latitude $64^{\circ} 20'$ and E. longitude $152^{\circ} 55'$ (three miles, it would give their position for noon of the 11th as $64^{\circ} 40'$ and longitude $150^{\circ} 45'$ E. Gr. W. 11 does not at all accord with the subsequently narrated course, etc. If we proceed on the hypothesis that it is true that the log recorded 30 miles and that only 20 miles were made good (which might easily happen if the ice current were running strong on the way north of the strait) and that their position was about 12 miles from the Siberian shore in a general way they would have been, at noon of August 12th, in latitude $64^{\circ} 40'$ and longitude 150° E. or at Caradenta, which agrees very fairly with the known river stations.

Aug. 13-24. A fresh breeze and fairly weather. The icebergs sailed the whole day with no land in sight and the distance of latitude was only 7 miles at noon, reckoned from noon of the 12th. The wind drove ahead toward night.

Notes.—On the same hypothesis as to the meaning of "distance of latitude" as the words are used at Lauridsen, the distance of noon of the 12th would have been 40 or 50 miles east of East Cape and a slight addition to $65^{\circ} 50'$. If the words are to be taken strictly as a navigator would use them, the land-ice would have been about fifteen miles to the westward and southward of East Cape, which agrees more well with the above, and by detail of circumstances. With the antiquated beginning of noon on the 12th according to Lauridsen the weather began to be much more cloudy which would check their progress.

Aug. 14-25. This is the festival of Saint Peter's of Africa. A current was experienced during the day which was estimated to have moved the vessel northward 1° . This current ran from south and east to north and west. From noon of the 13th to noon of the 14th the vessel and 120 miles in distance of latitude (H.). At noon the latitude was estimated

* A passage at length shows that the other part of the record is simply a misprint. 1872 only says they only used the land-ice (distance $25^{\circ} 41'$ easterly by an angle of observation). Long table is not shown. 1892, 1893 and 1894.

to 10° 06' 41" and high land was visible across. At three o'clock in the afternoon high mountains were observed to the westward, which, says Captain, "were probably out of the continent."

Notes. The following hypothesis of the run of the coast was after estimation of the latitude was overestimated. Admitting the estimated run to the position of a meridian for our hypothesis for the 12th and 13th it will put the island at about August 4th, in about north latitude 60° 24' and longitude E. 10° 19' 30". Captain's reckoning as given by Larsson when I have put this island on the coast after manner of where when the ship spoken of would have been out of sight. Our hypothesis puts her about twenty-eight miles N. E. from East Cape when the ship and of course so far, under favorable circumstances, might have been seen even if the sky were overcast. Clouds do not interfere with seeing. There is talked by Larsson. During this day the temperature varied between East Cape and the straits now known as the Pribilof straits. The shore in sight near by. What then should it be noted in the log that "ship land was seen across" at 10:30? The high land of which they had seen one sailed along for days in full sight of it. It was so near that the ice in the bay was not the big refuse to which the ship had not, but what was seen was the land of which had before seen as at the time as it was of August. It may not have been seen to the command or had not have been marked enough for the command or did not to have put it in the log with the don't remembering and duty to do. On morning, the ship's position is marked in.

It is supposed to have been American after Larsson, if and confirmed by statements of the American mariners. In that direction the land had been noted. The suggestion is of importance to ascertain with the subsequent conduct of Bering and will be referred to here in its proper connection. The further fact that a fairly precise version of Larsson's story of what was seen to the south the notes in it as the island of St. Lawrence and that this was the festival of that obscure saint led to further information to be taken as given as

Aug. 15-16. The *Centurion* sailed to have continued to sail in a northerly direction. At three o'clock in the afternoon, having been informed by the crew that the extent of fog was not so great as it was, many whales were seen and the ship averaged between 10 and 15 in distance. As the fog was water had appeared when it was observed. The fog was not cut at the mouth of straits. Between noon and four o'clock the vessel was under way in the straits and was in the post of the *Centurion* but could not see any more of the coast. It was at 10° 14' and 10° 17' and could not see more of the coast than the land of the coast.

*Larsson got over the description by putting the word "strait" before "see." A mistake in the text is nothing in the original because even from this view of the coast.

At the mouth of the river

the whole, more or less recorded in the transcript in the possession of the
at Kertug's report. But as there is no reason to suppose that these were
altered in the ship's company officially at the time, a general criticism of
being not to be inferred until the total results of the voyage are discussed.
The course set, according to Chapman's journal, would, if made good,
have carried the vessel past of Cape Prince of Wales. The northwester current referred to by Chapman and re-
cognized by most navigators who have since visited those seas, would
have carried the vessel more to the westward as was actually the result
and it was probably allowed for.

August 10th: Land appeared. The *Leontide* kept her
true course with a free wind making more than seven knots per hour.
At nine in the morning they found themselves off a
high promontory on the west, where there were a number of small
hills. To the east and seaward they saw no island, which it was
supposed to be, after the sunset of the day. At noon the vessel
found the shore to the westward, 15 miles and had reached her
true 60° N. Continuing on their way, with a free breeze and
cloudy weather they sailed along the Asiatic coast near enough
to observe many natives and at two places they saw dwellings.
At three in the afternoon land on the north was passed (indicated
by the highlands near St. Lawrence Bay).

Notes. From 8 P. M. Aug. 15th to 9 A. M. Aug. 16th is 16 hours, which
at seven knots an hour would drag the vessel across to be the equivalent
of the drift caused by the current would amount to 112 miles. If we
subtract from this the seven miles sailed between noon on 15 P. M. Aug. 15th
the opposite direction and we have remaining 105 miles to be sailed
homeward through a time when the drift would be between 100 and 110
miles and East Cape, or at least a plain sight of both. But 12
hours later, at noon according to Lauridsen, they had made only 11
miles and, although the breeze was free and fair. From this we
position for the vessel is to be about 100-102° off East Cape or 10
miles. From our hypothetically corrected position for the turning
point, off Cape Seppel, the distance would be to the same place 120
miles, or thereabouts. It is evident that there was a considerable
error in the record here, which, we found further south, it is not possible
to correct.

It is certain that Kertug was the first of naming any new
stream, which have noted, did not then name the island here men-
tioned after St. Demetrius. On all copies of the current version of his
chart it appears at the bottom for the name of the vessel of St. Demetrius.
From this we must suspect that he identified it with the high land seen
Aug. 14th, St. Demetrius day, which he had heard of, and the bay
were not the same proposed the name of Demetrius for the present.

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mind, regarding the high land as something distinct. If the lucky and self-willed Spanditz was the one who reported the land Aug. 14, he, and if he saw the high land about Cape Pr. of Wales, he surely did not take a long time to have been the last to admit that the relatively even land a large island now seen would be determined with any discovery.

Aug. 17-29. The breeze having been strong and fair an observation at 8 a.m. also took latitude was $64^{\circ} 27'$ and that the *Centinel* had sailed 104 miles since noon of the 16. In the afternoon the wind died and the wind became light and variable but strong this afternoon.

A distance of 104 miles from the position of the previous noon would have put the *Centinel* at latitude $63^{\circ} 24'$. The greater distance sailed by the *Centinel* from $66^{\circ} 02'$ to $64^{\circ} 27'$ is about 107 miles. It is possible that in copying or printing 104 miles has become transcribed as 104 miles. There is no obvious error here of some kind.

Aug. 29. Lauridsen does not refer to any record for the day, but it is probable that the wind increased again and the weather fair and that the *Centinel* was slowly working her way westward and southward in the vicinity of Cape (C. Kotzebue).

Aug. 10-31. In the afternoon being in the vicinity of the place where they had met the Chukchi boat on the distant voyage, four landers were seen with their crews pulling for the vessel, which accordingly lay by for them to come up with her. There were ten natives to each lander or forty in all. They brought no deer meat, fish, or fresh water. Large bladders for skin for wine they were suitably rewarded, while the crews of the *Centinel* got much from them as well of the red and the polar foxes and four walrus teeth, while the natives bartered for needles, d. compasses for striking fire, and iron. These Chukchi told them that they went over land to trade at the Kongra River, carrying their goods with reindeer, at that day never seen by sea. They had long known two Russians and one of them had even been to the Anadyrsk for trade. From this time they had hopes of gaining valuable information by the vessel to them not so good that they had learned from the first Chukchi who had been questioned.

Aug. 30-31 to Aug. 2. For this period the diary notes are due to the give no information, but the *Centinel* was doubtless

Laurentsen has ascribed to Bering's own initiative the willingness to make another search for land as if these lands were original with him. It is evident that this is unjustified and, indeed, absurd. More's account shows that the movement to a second attempt proceeded from the readiness of the crew and that Bering merely assented with their suggestion and Bering says so himself in his report.

On June 15-16, 1740, the *Centinel* left the mouth of the Kametshko River and stood out to seaward, downy off shore. She continued on this course about forty-eight hours, sailing a distance very roughly estimated for a ninety to one hundred and forty miles. The weather was foggy, no wind was seen, the wind shifted, to drizzle, then to east-northeast, and on the third day Bering gave up the search and steered for the equinoctial point of Kametshka, the extremity of which is marked by the point known as Narrow (Usko) Cape or more generally as Silver (Serebry) Cape, from its low square summit. He determined to let up to of this cape, and passing through the strait south of it reached a head-land in the west coast of Kametshka on the second of July. Most of this time was probably spent in tracing the form of the southern part of Kametshka and half way between it and Kametshka Bay it was ascertained that the variation was believed to be only about easterly, and off Avatsh Bay to west-quarters of a point westerly.

In the Autograph transcription of Laurentsen's diary, p. 61, that Bering fixed the difference of longitude for which one should find the longitude between Hothortek and Lower Kametshka being as 8° 20'. But in Bering's report, the former is given as 8°, which in his list of positions is a longitude ascribed to a west-hand station point. In Laurentsen's list it is given as 20°, which is a correction of an obvious error of 12° for a longitude of 8°. The true difference of longitude according to the latest charts is about 5° 45'. Where Laurentsen got his figure of 8° is not clear. He may have mistaken that Bering was the first to see Cape Lopatka but he *thought* he had made his voyage to it, though his commander is not known.

At Hothortek Bering left a crew for the *Barfina* which had returned earlier; turned over some of his surplus stores to the local natives; and on the 11-25 July sailed for the Hothoran Bay for the last time where he arrived Aug. 9. Here after some days spent in turning over provisions, especially to the local natives and preparing to return north, he left Okhotsk Aug. 20 on the overland journey to St. Peterburg. The second eclipse of the moon for the year occurred on the 15th, the morning hours of daylight, and hence was visible in this part of Asia.

After an uneventful and successful journey Bering arrived in St. Petersburg Aug. 14, 1740, bringing with him, according to the maps, the map and report which had prepared upon his expedition.

* Laurentsen says July, which is erroneous.

1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688

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he would have been disposed to accept as conclusive evidence which would not be so regarded by others. All the evidence shows Bering as faithful to the letter of his orders, honest, patient with the ill-doing or misinformed notion of others, but perfectly satisfied with the accomplishment of what he had been specifically directed to perform, and with a tendency to limit the specifications to the narrowest construction they would bear. He sawed and nothing beyond. In the arbitrary government under which he served, with the violent competition between foreign officers in the Russian service for promotion in rank and pay, who would have been the influence and caution which kept him well within his instructions? I certainly do not. But to say that he was a cautious, prudent and judicious officer, is a different

matter. I have not been

justifying him in

At all events in the present case it is not to him, or have been suggested by his officers or by the Kamchatskans after his return that the mere sailing off shore in a shallow water for twenty four hours, was not an absolutely conclusive proof that the continents were separated. Here was a man with a new vessel, a fit crew, a year's provisions for all hands, who has come half around the globe, taking three and a half years to do it, adding shipwreck and loss of labor of one sort or another; and thus to get into the region where there is a possibility of discovery, and when he gets there he barely gives twenty-four hours to searching for that coast with a month of the season still available for work; and then starts for home without settling the question, with a right conclusion, it is true, but not of his own discovery, and without assuming definite proof to deny it.

Leaving out of account the continent within half a day's sail which he fairly ran away from, granting, where is there anything adventurous, daring or heroic in such conduct?

It is evident that if Bering had sailed along the coast which the Chukchas said extended to the westward, instead of going off and away from it, he would have confirmed that part of their testimony, and given legal probability to the assumption of their correctness at the rest.

As it was, he left the question in a state so unsettled as to be a subject of debate for nearly half a century, even authorities so

fracture as Dr Campbell, assuming with great confidence that Hering's conclusions as to the separation of the two continents were erroneous. It was not until the voyages of Charles Cook and his associates were given to the world in 1844 that the matter was settled in your favor.

Even as regard to the details of his voyage it was only through the publication of Campbell's account of the voyage in 1850 that the public were informed as to what Hering saw, and it was not until 1847 that the *Illustration*, but still analogous to *Report* of 1790 was necessary even in its own type graphy.

We find that all the authorities who published in the last century accounts of Hering's map and accounts of his expedition were misled by the "Illustration" interested in our continent by the

misunderstanding was that he had sailed along the Chukchi coast, as above suggested, and that the far west point was in latitude 60° 15' on the coast of north America.

It was a position that none of our experienced authorities, as Dr. Huber and P. Anvers and Melzer, and Lacroix, and Euler and Campbell were able to leave.

The facts are as follows:

(1) The various reports of the voyage, the logbook of the expedition, Hering's chart in its entirety, were inaccessible to the public for many years; the chart has never been fully engraved for publication.

(2) The fragments of the Report which were circulated in print were ambiguous in their language or erroneously rendered, while the published reductions of the chart which got into print were misleading, or even erroneous.

(3) Two conflicting versions of the manuscript chart were circulated and appear to have been erroneously sent out. The one which appears to be the later of the two is in some details quite erroneous and at variance with Hering's report as printed and with the facts derived from Campbell's logbook, these two constituting the only authentic original information which has yet reached the public in printed form. But these two sources of correct data about the expedition were not printed until long after the charts had been widely circulated, while the extracts from the Report which appeared in print even under so friendly an editor as Dr Campbell, were so modified as to support rather than expose the original error. How then arose there may be something in the Russian archives to explain, or, if not, the case

very reasonable. Whatever conclusion one arrives at, it is difficult to account for any of all responsibility for the misdirection, if, as Laundon claims, he was responsible for the chart of De Halde in the form it was engraved.

In his report he states that the thermometer at that time was 67° F., that "all along the northeast in this place was a cold & stormy time." On turning to the De Halde chart we find the range of latitude from 60° to 65° N. and the range of longitude from 150° to 160° W. where it stops. If we had drawn the chart so, it would have been deception, but it is quite as probable that the editor modified the chart in engraving it, to correspond to his understanding of Bering's nauticality. As this would present the appearance of a correction of the error noticed by Bering, it would have been nothing surprising if Campbell's interpolation of a false longitude for lower latitude, might have been, not a typographical error, but an attempt to make the position agree with erroneous assumption. If it was a premeditated, the consequence is extraordinary. Of course Bering never was on the coast but De Halde's map is so engraved as to lead directly to the inference that he had been.

Again Bering says in his Report that at the turning point the land no longer extended to the north and that no projecting points could be observed in any direction. Since he undoubtedly sailed away from the shores without a intention to follow their trend this observation would, as a sailor, make us suppose it addressed to a vessel who took it for granted that the vessel was still skirting the coast. There is no mention in his Report of the fact that he had sailed away from the coast, nor of the still more important fact that the wind was blowing from the west and was comparatively shadowed and discolored. Of course if there is no direct proof of the separation of Asia and America this last evidence would tend to indicate that Bering was only in a bay or shoal arm of the sea and that he supposed it all was, if not a want of color, at least an impression is retained.

The map for the day when it was made (in the earlier version) was a good one, and is appropriately praised by Cook, who had a copy of the chart Harris on his vessel when exploring in the same region fifty years later.

In his report of the trip eastward from Kamchatka in 1790, Bering says nothing about the weather being foggy or stormy,

not merely asserts that he sailed nearly 200 miles and saw no trace of land. He leaves it to be inferred that he could have seen land if it had been there to see, which if the weather was foggy was not true.

The impression which these facts leave upon the mind is that Herring did certainly frame his language so as to convey the idea that his evidence of the separation of the two continents and of the absence of land eastward from Kamohatka was more conclusive than it was in reality.

That this was done to avoid criticism seems a natural inference. That an examination of his list of positions would have shown the location of the point whence he turned back to be to the eastward of the easternmost of his reported—and in truth, but his list of positions was not published with his report, does not agree with his maps, and when published by Campbell was garbled, as I have shown.

That the truth, however, did get out and that criticism was not successfully avoided, is a matter of history. There can be little doubt that Herring's anxiety to undertake the second expedition, which followed, was stimulated by a desire to set these questions (which would naturally be nagged by his enemies, finally at rest.

It may be suggested that Herring's report was modified by the authorities, though why they should make the particular modification is not very evident. Herring was the only person who could probably claim the natural conclusion is that he should be held responsible.

I am writing out that some of Herring's acts are vulnerable to criticism. I am far from desiring to wound his memory or give the impression that he was not entitled to great praise for what he accomplished, much of which was admirably done.

I am, however, sure that the facts are as stated, and that the authorities who have modified his report have done so in a way that is not fair to his memory.

If the interest in the subject be stimulated by the use of these opposing points of view so as to result in the publication of some of the material still hidden in the Nassau archives I shall be more than repaid for the time I have devoted to the question, even if the publication of the original should show some of my conclusions to be ill-founded or erroneous.

In this table the calendar is Gregorian, the moon is synodic or true sun time, the day is reckoned from noon and the hours are counted eastward as is through the entire 24.

The present observatory in Rensselaer is at

Latitude $50^{\circ} 43' 45''$ N.

Longitude $0^{\circ} 38' 29''$ E. from Greenwich.

At the date of the *first eclipse* Hering was on his way across the southern end of Kankakee from Bushy Park to Lower Kankakee. This would make his position somewhere near latitude 55° N. and longitude 150° or $10^{\circ} 40''$ E. from Greenwich.

He was therefore $1^{\text{h}} 1^{\text{m}}$ east of noon for which we have the elements of the eclipse as computed by Manfred L. Wolf. These data together with the latitude and sun's elevation we have the following data for the eclipse in the region where Hering was.

Beginning of eclipse	4 ^h 41 ^m
Midst of eclipse	6 ^h 0 ^m
End of eclipse	7 ^h 41 ^m
Sun sets	8 ^h 07 ^m

The moon then the sun set, bearing about W. by S. $\frac{1}{2}$ S., and the moon rose in partial eclipse, bearing about E. by N. $\frac{1}{2}$ N., at 3^h 47^m after apparent noon, or 34 minutes after the eclipse had begun. The eclipse lasted for 2^h 44^m after sunset, or until 7^h 44^m in the evening, thus rendering observation of the last contact hardly visible.

At the date of the *second eclipse* of 1828, August 16, Hering was at some place in the vicinity of the strait which separates

Assuming his position to have been latitude 65° N. and longitude 150° or $10^{\circ} 30''$ E. from Greenwich, equal to $12^{\text{h}} 34^{\text{m}}$ E. from noon, and as before taking the data from Manfred's ephemeris we have as follows:

Beginning of eclipse	6 ^h 0 ^m
Midst of eclipse	7 ^h 30 ^m
End of eclipse	9 ^h 0 ^m

It thus appears that the first contact of this partial eclipse of the sun with limb of the moon may have been just barely visible to Hering. The moon bearing about SW. by W., was the earth's shadow about two or at the best one the sun's rising and its own setting. It may be remarked as a chance in determining the possibility to Hering of observing this eclipse that a more precise calculation is possible.

At the date of the *first lunar eclipse of 1733*, February 13, Bering was at Lower Khatanga, in latitude $54^{\circ} 03' N.$ and longitude $102^{\circ} 15'$ or $10^{\circ} 49' E.$ from Greenwich equal to $10^{\circ} 21' E.$ from Paris. For this place we have from Murfrees

Eclipse begins	28 ^h 30 ^m
Total immersion	29 07
Middle of eclipse	29 58
Eclipse begins	30 45
Eclipse ends	31 43
Duration	31 13

Thus it appears that this total and almost central eclipse of the moon lasting $3^h 4^m$ began at Bering's station 1^h and 5^m before sunrise of February 11, the total immersion commencing 1^h and 10^m before sunrise. It is accordingly, therefore, that Bering observed this eclipse.

The *second lunar eclipse of 1733* occurred August 8, when Bering was in or near Chotok and about en route to Europe. We may assume his position to have been latitude $50^{\circ} 20' N.$ and longitude $142^{\circ} 40'$ or $9^{\circ} 31' E.$ from Greenwich, equal to $0^{\circ} 03' E.$ from Paris. This eclipse was also total and almost central, but at Bering's station was very oblique, beginning at $9^h 00^m$ and ending at $1^h 45^m$ on August 9.

